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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 1 April, 1936

NOTES FOR THE MONTH

Coal-Cattle, etc., arrangement with the Irish Free State

As stated in the Note in the March issue of this JOURNAL (p.1265) giving the main lines of this arrangement, the new rates of duty on goods imported into the United Kingdom from the Irish Free State are set out in the Irish Free State (Special Duties) (No. 1) Order, 1936, which came into operation on February 19. The Order provides that "in any case where a duty chargeable on any goods under the Schedule to this Order would exceed the value thereof, the Schedule shall have effect as if for that duty there were substituted a duty of one hundred per cent. of the value of the goods."

The Schedule and the old rates of duty are shown below:

<i>Class of goods.</i>	<i>Rates of duty.</i>	<i>Old rates of duty.</i>
Live cattle—	£ s.	£ s.
(a) Under six months old ..	1 0 per head	1 5 per head
(b) Six months old but under 15 months old	2 0 " "	2 10 " "
(c) 15 months old but under two years old	3 0 " "	4 0 " "
(d) Two years old and upwards, not being cattle known as mincers	4 5 " "	6 0 " "
(e) Two years old and upwards, being cattle known as mincers	2 0 " "	3 0 " "
Live sheep and live lambs	5 " "	10 " "
Live horses	20 per cent. <i>ad valorem</i>	
Live pigs	40 per cent. <i>ad valorem</i>	40 per cent. <i>ad valorem</i>
Other live animals	30 per cent. <i>ad valorem</i>	
Meat—		
(a) Mutton or lamb—		
Carcasses	5s. 0d. per carcass	10s. 0d. per carcass
Sides	2s. 6d. per side	5s. 0d. per side
Other kinds	20 per cent. <i>ad valorem</i>	40 per cent. <i>ad valorem</i>

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(b) Pig's meat—				Such a rate of duty as will amount to 16s. per cwt. or to 40 per cent. of the value of the goods, whichever is the greater	As in the new Schedule
Carcasses .. ..	..	..	..
Other kinds .. ..	..	..	..	40 per cent. <i>ad valorem</i>	As in the new Schedule
(c) Beef and veal .. ..	..	..	..	30 per cent. <i>ad valorem</i>	40 per cent. <i>ad valorem</i>
(d) Edible offals .. ..	..	..	..	30 per cent. <i>ad valorem</i>	40 per cent. <i>ad valorem</i>
(e) Other meat .. ..	..	..	..	20 per cent. <i>ad valorem</i>	30 per cent. <i>ad valorem</i>
Poultry—					
(a) Dead—					
Fowls, ducks and geese ..	..	..	..	1d. per lb.	As in the new Schedule
Turkeys .. ..	..	..	..	2d. per lb.	
Other kinds .. ..	..	..	..	30 per cent. <i>ad valorem</i>	
				<i>ad valorem</i>	
(b) Live— .. ..	..	..	..	30 per cent. <i>ad valorem</i>	
Game, whether live or dead ..	..	..	..	30 per cent. <i>ad valorem</i>	
Butter .. ..	..	..	..
Eggs .. ..	..	..	..
Cream .. ..	..	..	..

The Irish Free State Government discontinued, after February 18, its export bounties on cattle and horses, which were: on cattle 2 years of age and upwards, 20s. per head maximum; and on horses, 20 per cent. *ad valorem* as assessed for British Customs duties, except that no bounty was paid on horses valued at under £10.

Farmyard Manure Distributors

THE following note has been communicated by Mr. J. E. Newman, Institute for Research in Agricultural Engineering, University of Oxford:—

Farmyard manure spreaders have been in general use in the United States and Canada for many years, but have never become in any way popular here. The conditions, however, are not the same in both countries. In America, the spreaders are used, in the main, to dispose of the manure from the stable or dairy of farms of which the great majority are one man or family farms, employing little or no hired labour. A machine that can be loaded up, driven away by the man who has loaded it, and then spread its load and return for another is

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much more useful, and fills a more definite place on such farms than on an English farm where manure carting is often a job for an organized labour gang and where at least two machines would be required in order to keep the men steadily employed.

Since the machines, until recently, cost over £60 each, the provision of two entailed an expenditure the economy of which was not very apparent, since they only saved the labour entailed in spreading the manure,* and in no way lessened the heavier work of loading and carting it. Their price, however, has recently been reduced and is now about £45, and their sales have shown some signs of increasing. These machines are, and always have been, all of Canadian or American manufacture, no British machines being made. They are of a fairly standard design that has become settled by experience. They are fairly long and narrow four-wheeled box wagons, narrow so that they can be driven into stables or barns. The box is about $1\frac{1}{2}$ in. wider at the back than at the front, to prevent the load wedging during its discharge. They have steel wheels, and are sometimes of all metal construction.

A drag chain conveyor, similar to that used in elevators, runs over the bottom and slowly moves the load towards the back, where it is scattered by rapidly revolving spiked beaters. Most makes provide two sets of beaters, one at the end of the wagon bed and the other a little before and above it. These beaters break up the manure, and throw it backwards on to a "wide spread" cylinder provided with fan-like blades, which spread the shredded manure over a width of 7 or 8 ft. The conveyor is driven by a ratchet wheel and rocker arm—a device which is simple and permits of easy variation of speed, and has completely superseded the worm drive formerly employed, which gave trouble owing to rapid wear. Chain drive is employed for the beaters, though one make that mounts the main beater on the rear axle, to allow of very low loading, uses an internal planetary gear. Wear and tear is heavy, particularly if lubrication is not thoroughly good.

The present design has not been reached without a good deal of change. The conveyor was formerly often of the moving apron type—that is, the whole floor was moved back-

* A standard cost is $4\frac{1}{2}$ d. per horse cart load. Carting costs 1s. to 1s. 6d. per load.

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wards as the load was discharged. The movement might be reversible or continuous. It is only in fairly recent years that the conveyor chain working over a solid floor has been adopted by all makers. Older designs used one beater only, sometimes with retarding rakes and sometimes not. The second overhead beater and the wide spreading cylinder are later additions. Some of the machines that have been tried and discarded in this country are of the older types.

Spreaders have difficulty in dealing with long-strawed manure, and the much more broken straw that the American threshing machine produces undoubtedly simplifies the task of manure spreaders on the other side of the Atlantic.

Two combine owners in this country who have used spreaders to handle manure made from short straw, harvested with combines, have had no trouble, but long-strawed manure invariably causes stoppages. Well-rotted manure is handled without difficulty.

Apart from saving the labour of spreading, there is no doubt that these machines spread the manure very evenly. Short, well-rotted manure is broken up into small particles, and spread very evenly indeed, far better than the most painstaking hand work with forks can accomplish.

The ordinary sized machine has a capacity of 75 cubic ft. and is pulled by two horses, though it is fairly hard work, and three are sometimes necessary. Tractor-operated machines of about double this capacity, with the gearing operated from the power take-off of the tractor, are now being made, but none have yet been imported. They are two-wheeled machines and the front end is carried on the tractor. Such machines, if fitted with pneumatic tyres and pulled by a pneumatic-tyred tractor, could get through a lot of work, while the use of the power take-off simplifies the design and allows the gearing to be effectively protected.

A manure beater and elevator, intended to pulverize matted manure and load it at the same time, was brought out last year by an English firm. Its use might enable distributors to handle manure in any state.

Sale of Diseased Plants (Amendment) Order of 1936

THE sale, or exposure for sale, for planting of any plants substantially attacked by certain pests and diseases has been prohibited for some 15 years under the Sale of Diseased Plants Order of 1927 and earlier Orders of 1921 and 1922.

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A new Order, entitled the Sale of Diseased Plants (Amendment) Order of 1936, extending the provisions of the 1927 Order, has recently been made and will come into operation on May 1, 1936.

From that date, it will be an offence to sell, offer, or expose for sale, or, after sale, to deliver, for planting, any plant which is substantially affected by any of the following diseases or pests:—Fruit Tree Cankers, American Gooseberry Mildew, Silver Leaf, Blackcurrant Mite, Woolly Aphis, all Scale Insects, Brown Tail Moth, Rhododendron Bug and Powdery Scab of Potatoes; any plant which bears evidence of having been substantially affected by the Apple Capsid; any tomato or cucumber plant substantially affected by the Greenhouse White Fly; and any potatoes or Narcissus or Daffodil plants or bulbs which are visibly rendered unfit for planting by reason of their being or having been affected by any insect or pest. (The expression "plant" includes tree and shrub, and the seeds, tubers, bulbs, layers, cuttings or any other parts of a plant.)

Copies of the Orders (S.R.&O. 1927, No. 350) and (S.R. & O. 1936, No. 163) may be obtained either directly or through any bookseller from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1d. each, post free 1½d. each.

Agriculture and Unemployment

In the course of a paper read before the Royal Society of Arts on February 26, Sir Daniel Hall showed from census returns that the number of farmers and their relatives in England and Wales remained practically constant through the sixty years from 1871 to 1931, although during that period the cultivated area declined by about 4 per cent. Meanwhile the number of employees, almost entirely labourers on a weekly wage, shrank at the rate of approximately 8,000 per annum, the only exception being the decade 1901-11. Over the whole period the loss was more than 40 per cent. One of the causes of this migration was the introduction of machinery, enabling farm operations to be carried on with less man power; another was the continuous change from arable to pasture, some four million acres of the former being grassed between 1872 and 1914, a fact that by itself would account for loss of employment for 100,000 men. Although the rural exodus was principally in response to economic

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pressure, it was probable that men were even more attracted from the land than driven off it.

During the period 1870 to 1934, holdings of 1 to 5 acres diminished by 40 per cent. These were chiefly supplementary holdings and accommodation lands swallowed up by urban expansion. The 15-20 acre holdings lost 18 per cent. of their numbers, but the 20-50 acre class, although less numerous, retained practically the same acreage in cultivation. The continued decrease in the number of small holdings, despite deliberate efforts to increase them, was sufficient evidence that they no longer represented a form of occupation that would attract and retain men. In the speaker's opinion it was a mistake to endeavour to return to the small unit of the family farm. The trend of English agriculture showed a gradual conversion of peasant holdings into commercial farms, and it was associated with a rising standard of living. In countries where family farmers represented from 30 to 70 per cent. of the working population, extreme protectionist policies had to be adopted in order to preserve the peasant structure.

It would be wrong, however, to conclude that agriculture in this country must inevitably continue to employ fewer and fewer men. In certain directions there was even an opportunity for smallholders, provided that they could be made producing units in a large organization. They would need to specialize in a single branch of farming, and to become tied members of a single concern. Mechanization did not necessarily imply fewer men on the land; fewer would be required for each operation, but more operations would be possible.

Finally, if they desired the return of any considerable number of men to agriculture, they must make it a reasonably attractive employment. Men had left the land almost entirely because conditions were poor and alternative employment was offered elsewhere. In spite of statutory minimum wages, agricultural labourers were still the poorest paid body of workers in the country. The old allowances of milk, meal, bacon and potatoes had been generally given up. Cottages were cheap, but against this must be set the comparative isolation, the darkness and dirt of the country roads, the expensive shops and inferior schools. Certainly there was room for a large increase in the numbers of men on the land, but it would involve considerable changes in methods of using the land, rendering it generally remunerative and capable of

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paying wages that would compete with those received by industrial and commercial employees.

Herbs

HERBS to-day are no longer confessedly grown, as they were by our ancestors, for such diverse and entertaining uses as "to ward off Black Magic," to expel "Melancholick, Terable and Dredful Dreams," or "to test whether a wife be chaste or no"; but, to judge by the numerous enquiries received by the Ministry, much interest is being taken in their cultivation for admittedly less romantic and more utilitarian purposes. Herb-growing in private gardens is regaining its long lost popularity, and the revival of interest in rural industries has prompted many countrywomen to grow herbs both for pleasure and for profit.

In response to the increasing demand for information, the Ministry has recently issued a Bulletin* on the subject, the interest in which may be gauged from the fact that a second impression has been called for immediately on publication.

The material for this Bulletin was obtained as the result of visits to established herb growers in different parts of the country, at which a close study of the growing plants was made and the various aspects of production were discussed with the growers. Special attention has naturally been given to the cultivation of mint, parsley and sage, but the Bulletin is not restricted to culinary and flavouring herbs, and sections are devoted to aromatic herbs used in perfumery and confectionery, and to herbs that are medicinal in the strict modern pharmaceutical sense of the word. The Bulletin concludes with a series of notes on herbs that may be gathered wild and are still in occasional demand.

Land Drainage Act, 1930:

Issue of Handbook

A SMALL Handbook on the Land Drainage Act, 1930, has recently been issued by the Ministry for the guidance of local authorities and others concerned with land drainage. It will be remembered that the Act not only consolidated and amended all previous legislation in regard to land drainage

* Herbs. *Bulletin No. 76*. Price 1s. (by post 1s. 2d.). Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

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in England and Wales, but contained new provisions dealing with the creation of Catchment Areas and the constitution of Catchment Boards. There is a good deal of material, therefore, to summarize, and this is done in orderly fashion in the Handbook, although for complete details recourse must be had to the Act itself.

The Handbook, which is intended mainly for the use of those charged with the administration of the Act, i.e., Members of Drainage Authorities, County and County Borough Councils, etc., may be obtained, price 1s. (1s. 2d. post free), from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller.

Huskless Oats

THE following note, by Professor Sir R. H. Biffen, F.R.S., Scientific Adviser to the National Institute of Agricultural Botany, which has been communicated by the Institute, may be of general interest:—

These oats differ from our ordinary varieties in two important respects. The first is that the thin, paper-like husks surrounding the grain do not grip it tightly, with the result that on threshing the naked grains are set free just as those of wheat are. The second is that they have some six or seven grains in each spikelet instead of the usual two or three. These grains are loosely strung on a stalk sufficiently long for two or three to protrude and hang down well below the glumes. As the result of this exposure considerable losses from shattering may be expected in unfavourable harvesting conditions. It is responsible, too, for giving the standing crop the appearance of being phenomenally high yielding: but this expectation is not realized on threshing any more than is the expectation that a barley with six rows of grain must out-crop one with two rows only.

It is not generally known that a naked-grained oat, known as Pilcorn, is grown in Ireland, where its cultivation is confined to a few very limited districts in which the climatic and soil conditions are too bad for growing the ordinary varieties.

It may be that Pilcorn is a survival of an oat grown generally in this country in mediæval times, but which has long since dropped out of existence here. If so, there were various types of it, for Gerard, writing in 1597, describes a "large naked oat" which was then grown in Norfolk and Suffolk. It was evidently differentiated by the size of its

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grain from Pilcorn, the grains of which are so small that to a casual observer they might pass as grass seed rather than as cereal.

To turn to more recent times, in 1910 and 1911 a well-known English seed firm catalogued and marketed a strain of huskless oats. After 1911, this strain disappeared both from their catalogue and from cultivation.

Most of the huskless oats now in existence come from China, where several distinct forms are in cultivation, but though these have been tried in many countries during the past half century their range of cultivation has not increased to any extent. Of late years experimenters have paid a great deal of attention to these Chinese oats. Collections of all available forms have been got together repeatedly—not only here but on the Continent and in America—and many crosses have been made in the hope of producing a normal oat with a larger number of grains in each spikelet. The results have been of considerable scientific interest, but, from an economic point of view, the experiments can only be described as complete failures. Apparently none of these experimenters, although it is an important part of a plant breeder's work to assess the agricultural value of the material they collect, has seen fit to recommend the general cultivation of huskless oats. It is significant, too, that none of them has put on record the results of critical large-scale yield trials. The probable explanation is that they have not considered such trials worth making.

One English firm of seedsmen, famous throughout the world for the cereal varieties which it has bred and distributed, has for the past forty years used strains of naked oats for crossing with many varieties of the ordinary cultivated oats. Two years ago they abandoned this work, having become convinced that the chances of obtaining any derivative of outstanding agricultural value were negligible.

Comparisons of the yield, on a per plant rather than a per acre basis, are given by Koernicke, whose collection contained every available variety of oats. Even when 25 per cent. of the weight of the grain is knocked off to allow for the weight of the husks of the ordinary oats, the huskless oats compared very unfavourably with them. In fact he finishes his description of one of the best of the naked-grained types by stating that it had no agricultural importance as far as Germany was concerned. It may well be that this conclusion

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is correct for this country too. There is evidence for this in the complete failure of the huskless oat to establish itself here when introduced into this country about a quarter of a century ago. If the writer's recollections are to be trusted, the last crops of it were grown three years later.

Protection of Crops Against Birds

THE Ministry is frequently asked to suggest some effective means of scaring birds from field and garden crops, as many people rightly dislike the idea of killing birds. There are some birds that cause damage to agricultural and horticultural crops at certain seasons of the year, but which on balance are beneficial both to the farmer and the gardener. Consequently, preventive methods should always be tried before resorting to drastic measures.

It is, however, not easy to formulate any method that is of real value. The chief difficulty is that birds soon become used to most devices and are quick to realize their harmlessness; in short, "familiarity breeds contempt." The result is that, however effective such devices may be for a short period, they usually cease to be of use before the crops they are designed to protect have reached a safe stage of growth, or, as regards fruit crops, before they can be gathered.

The bird-scaring devices adopted by farmers, gardeners and others are many and various, but they may be roughly divided into four categories: (1) those which produce noises, (2) those that move; (3) imitations of creatures which birds have learned to regard as enemies; and (4) preventive devices such as netting, cotton, thread, etc.

In category (1) the use of guns, clappers, rattles and other noise-producing implements may be effective, provided that a sufficient number of persons is employed and that the noises are made fairly continuously. It is, however, difficult, if not impossible, for the average farmer to employ a sufficient number of human bird-scarers adequately to cover his land. On small holdings and in gardens the task is less difficult, but is still far from easy to accomplish. There are on the market automatic field clock guns and other machines that produce loud noises at regular intervals, and it has been claimed that they have given good results.

In category (2) are included many contrivances—such as pieces of mirror, tin or other metal, broken bottles, paper,

and other things—that are usually strung across the ground that it is desired to protect. These contrivances sway in the wind and quite frequently combine noise and movement. It is doubtful whether any of them are of value, except for a very short time, since birds quickly detect them for the harmless frauds they are, and soon ignore them.

(3) The principal and most popular item in this group is the time-honoured "scarecrow," usually composed of an assortment of human apparel, draped on a pole or a wooden frame, and often badly put together. It can hardly be said that this device is of much value, although there is one method of placing such a bird-scare that is sometimes effective on poultry farms. Poultry breeders are often much troubled by carrion crows—exceedingly cunning birds, which do great damage by stealing eggs and killing and carrying away young chickens. If there is a hedge, not too dense, near the poultry runs, and a scarecrow in human form be partially concealed therein, the crows will usually keep away, being at all times wary and suspicious of man and not being able to see sufficiently clearly to determine whether or not the crouching figure is alive. This plan has also been found to be effective with other predatory birds, and it is possible that its use on horticultural land might be worth while.

The flat imitation cats of metal that are sometimes seen in gardens are of little use if continuously kept in the same places, even though they may be arranged so that they swing in the wind. Better results will be obtained if they are moved to fresh positions each night. The practice of suspending dead crows or other birds that have been killed has little to recommend it, but it is worthy of note that a dead rook or crow that has been pulled to pieces is apparently much more effective. The portions of the body, wings, etc., should be strewn about and left lying on the ground.

In category (4) will be found the most useful and practicable protective measures for small areas. Netting of suitable mesh is undoubtedly the best for the protection of strawberries, cherries and other horticultural crops, but the provision of sufficient netting to cover a large plot or a number of trees is expensive. For some plots, the next in order of merit is thread or cotton, crossed at close intervals a few inches above the ground and affixed to wooden pegs. Black thread or cotton is by far the best, since birds often fail to notice it before striking it, hence it has the element of surprise.

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and birds are naturally scared by coming into contact with anything that suggests a snare or trap. Many gardeners have obtained good results from the use of narrow black "hat" elastic; it is necessary to employ only a few strands, which are stretched tightly across the plot about 6 in. above the soil. The elastic vibrates in the wind, even in a light breeze, and the resultant humming appears to frighten sparrows and other birds.

The Official Seed Testing Station in 1934-35

THE Report* for the year 1934-35 shows that, in the twelve months ended July 31, 1935, the Official Seed Testing Station tested 28,327 samples from outside sources. This compares with 27,077 samples in the season 1933-34, and is the highest number ever tested during the twelve-month period. In addition, 2,175 samples were dealt with in the course of various investigations.

It is of interest that, as in the previous season, the Station received over 1,000 samples of grass seeds not covered by the Seeds Regulations. In the main, these consisted of species of *Poa*, *Festuca* and *Agrostis*, i.e., turf production grasses.

The number of such samples was, in the season 1923-24, only 189, but the numbers have steadily grown since that time. Confidence in the ability of the Station to test such difficult samples, together with an increased interest in most of the species on the part of golf and other sports clubs, has been responsible to a large extent for the striking increases recorded in recent years.

Another feature, as regards grasses, which is worthy of note, is the fact that no fewer than 10 per cent. of the samples of timothy received during 1934-35 were found to contain dodder. All these were of European origin, the number of such samples being abnormally high owing to the shortness of the American crop. The latter is usually free from dodder.

Each season, a certain number of samples of celery seed is submitted to the Station for examination for the presence of seed-borne diseases, and, in recent years, an increasing interest has been displayed by the senders of such samples in the incidence of *Phoma apiicola* (*Phoma* root-rot) as well as of *Septoria Apii* (celery leaf-spot). An examination for both

* The Report of the National Institute of Agricultural Botany, Cambridge, 1934-35.

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diseases is now made of all samples submitted for special examination, the numbers of such samples totalling 92 during the season 1931-32, and 157, 42 and 49 in succeeding years.

An activity of the Station which is sometimes overlooked, but which is of decided value, particularly in connexion with field trials, is the determination of the moisture content of cereals and sugar-beet seed, the number of such samples in the season under review being 113. Moisture content determinations as well as germination tests were also carried out on samples of Chewings Fescue received from New Zealand. These form part of an investigation, in collaboration with the New Zealand Seed Testing Station, into the effect of initial moisture content on samples of Chewings Fescue stored under varying conditions during transit to this country.

The Wild White Clover Certification Scheme, organized by the Ministry of Agriculture in co-operation with the National Farmers' Union with the object of encouraging and assisting the production and marketing of genuine home-produced wild white clover seed, has now been in operation for six seasons; and, during this period, the Station has dealt with a total of 890 "head" samples collected from pastures inspected under the scheme, including 37 received in 1934 and 15 in 1935. These "head" samples are collected in the summer of each year, and, upon their receipt at the Station, the seed is rubbed out, scarified and sown in row plots in the early autumn, the resulting plots being examined in the following summer by a committee set up for the purpose.

A course of instruction in seed analysis was conducted at the Station from June 17 to July 18, 1935, the last two days being occupied with examinations. Twenty analysts attended the course, including four members of the Station's own staff—twelve being successful in both theory and practice and seven passing the practical examination only. The results of the examination, although disappointing in that a larger proportion did not obtain their certificates of proficiency, should not be taken as reflecting upon the industry of the candidates, for, without exception, the students displayed considerable keenness and worked well. The inability to deal successfully with the theoretical papers in the examination must, in the majority of instances, be attributed to the fact that the students concerned had had little or no experience of examinations and were unable adequately to express themselves on paper. The course is designed essentially to fit analysts to

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take full charge of private licensed stations; and, although greater importance is attached to the actual practice of seed analysis, it is also necessary to give some weight to the more theoretical aspects of the subject.

Western Commercial Horticultural Spring Show, Penzance

ALTHOUGH it is only thirteen years since this show was first held, it has attained much more than a local importance; growers and others concerned with the production and sale of early flowers and vegetables came to Penzance on March 12 from all parts of England. In the co-operative exhibit that formed the background to the opening ceremony on the platform, broccoli and market boxes of yellow trumpet daffodils dominated the picture and seemed symbolical of the two choicest and most important products of the district.

The competitive flower classes gave an interesting indication of modern trends in the flower industry. King Alfred holds undisputed leadership among the yellow trumpet daffodils so well and widely grown in the district, and the coveted Prince of Wales cup was again won by an exhibit of this variety. Sunrise, a red-gold and apricot *Barrii* variety, has made an almost meteoric rise to pre-eminence during the last decade and was very well shown. Other varieties in their respective classes were Spring Glory, a bicolor which out-classed the long-established Victoria, and Coverack Glory, a striking *incomparabilis* of fairly recent introduction.

The area of anemones in Cornwall has greatly increased in recent years, coincident with the enhanced value of the crop following the introduction of tariff duties. The quality of these flowers is also greatly improved, long stems and large flowers being a feature of the prize-winning exhibits.

Early wallflowers—the yellow, the deep red and orange stained yellow, which are a feature of south-west Cornwall, were well shown. A new introduction, orange in colour, created much interest.

Broccoli, shown in a tent adjacent to the hall, was outstanding in a season when prices have reached almost unprecedented height as a result of shortage of vegetables. All the broccoli were of the Roscoff type and well packed in crates—two developments in the broccoli growing industry that can be traced to pioneer educational work begun in connexion with the Western Commercial Show.

THE CONTROL OF HEART ROT IN SUGAR-BEET

F. HANLEY, M.A.,

School of Agriculture, Cambridge, and

J. C. MANN, M.A.,

Norfolk County Council.

HEART ROT of mangolds, a disease primarily of the central young leaves of the crown, but, in bad cases, passing also to the top of the root and causing it to rot, has been known in this country for a very long time. Since it is a disorder resulting from unsatisfactory soil conditions, it was natural to expect that it would appear sooner or later in sugar-beet when that crop began to assume importance in this country. As early, indeed, as 1928, Heart Rot had become prevalent in sugar-beet in some localities here, more particularly in dry seasons and on light, alkaline soils. In the wet years, 1930 and 1931, it was uncommon, but the three successive dry seasons, 1933-1935, favoured its occurrence, and considerable interest in the matter has, therefore, now been aroused.

Symptoms and Effect on Yield. Various stages in the development of Heart Rot are shown in Fig. 1. In the early stages, the young central or "heart" leaves cease to grow, and curve slightly outwards. Scurfy patches appear on the inner surfaces of the leaves, which later turn black and die. Subsequently, the outer leaves may die off and a number of groups of young leaves are formed, and these will be quite healthy provided the conditions responsible for the trouble have, meanwhile, been removed. This development of new foliage is favoured by showery weather. In a severe attack, the roots may also become affected, in which case the centre or crown becomes discoloured and eventually decays, the rot spreading slowly down the outer part of the root. In badly affected roots, the decay may spread down the inner tissues also. A more detailed description of the symptoms of the trouble is given in the Ministry's Bulletin No. 93.*

* *Pests and Diseases of the Sugar-beet.* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 6d., post free 1s. 8d.

CONTROL OF HEART ROT IN SUGAR-BEET

The very serious losses that may result from Heart Rot are illustrated by the factory returns for the 1935 crop from a field in Norfolk on which a very high proportion of the beets was affected :—

Size of field	..	..	..	16 acres
Yield of washed beet	..	..	..	2·3 tons per acre
Sugar percentage	..	..	..	14·3

A sample of beets from this field, all badly affected by Heart Rot, was analysed during the first week in October and showed only 8·1 per cent. sugar content, the upper part of the roots being almost completely destroyed. The danger of such roots finding their way into the sample for analysis at the factory needs no further emphasis.

The Influence of Soil Conditions. Heart Rot is usually found only on alkaline soils. Experiments on the Continent and in the Irish Free State have shown that it can be controlled by applying a convenient source of boron to the soil, and the view is now generally held that the incidence of the trouble is probably due to boron deficiency, induced by alkaline soil conditions rendering the boron in the soil unavailable to the plant in a dry season.

Observations on a number of fields during the season 1935, coupled with information supplied by growers of mangolds and sugar-beet as to the occurrence of similar trouble in past seasons, support the view that dry soil conditions are an important factor in the development of the trouble. It has been noted that the worst cases encountered have been on very light soils containing high percentages of coarse sand or sand and gravel, overlying equally porous and coarse textured sub-soils. The trouble has also been observed, however, on light loams, and the two following instances are of particular interest from the standpoint of the possible effect of soil moisture conditions on the development of Heart Rot. In each instance, a large field sown with sugar-beet was situated on a gentle slope, the higher parts of the fields being light in texture and apt to suffer acutely from drought. The lower half of each field was slightly heavier in texture with a heavier sub-soil, and was more retentive of moisture than the upper half. In both fields, the crop on the upper portion of the slope suffered acutely from Heart Rot, whilst the lower portions of the fields carried useful crops with only a small number of beets (about 5 per cent.) showing signs of Heart

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Rot; and even those had not suffered serious loss in size. The soil on both lower and upper portions of these two fields was definitely alkaline (see Table 1) but though, in each field, the upper portion was slightly more alkaline than the lower portion, it seems probable that the better moisture conditions on the lower portions were also partly responsible for the better crop.

TABLE 1.—pH VALUE OF SOILS.

	<i>Field D.</i>	<i>Field P.</i>
Upper portion (much Heart Rot) ..	8·1	7·7
Lower portion (little Heart Rot) ..	7·8	7·3

A further interesting instance of Heart Rot encountered in Norfolk, in 1935, occurred on a field on which the soil was definitely acid in reaction (pH value=6·2) and actually showed a small lime requirement (Hutchinson and McLennan Method). The trouble in this case was only slight, about one per cent. of the beets being affected on a light loam soil in a rather dry situation, but it is of interest to note that soil acidity did not completely inhibit the occurrence of Heart Rot on this field.

An Experiment in Norfolk, 1935. The success that has followed the use of boron abroad led the writers of this article to try the effects of various dressings of boron, supplied in the form of borax, on a sugar-beet crop to be sown on a portion of a field on which sugar-beet had suffered severely from Heart Rot in 1934. In 1933, this field was cropped with oats, before which it had been in grass for several years; the oats received kainit at 5 cwt. per acre. For the 1934 sugar-beet crop, half a ton of fish waste per acre and a little sulphate of ammonia was applied. The soil was a light sand overlying sand and gravel, the pH value being 8·0.

To ascertain whether a mere trace of boron was sufficient or whether a larger quantity must be applied to effect complete control of the trouble, it was decided to compare the effects of applications of 0, 4, 14 and 28 lb. of borax per acre, each treatment being replicated four times on $\frac{1}{16}$ th acre plots arranged in the form of a Latin square. The appropriate amount of borax was thoroughly mixed with about 14 lb. of dry soil taken from the plot to which it was to be applied, and the mixture carefully distributed over the plot by hand. This operation was carried out on March 21, 1935, about one month after the land had been ploughed. The whole area was harrowed the following day and subsequently

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worked down and sown with sugar-beet on April 12, 1935. The following mixture of artificial fertilizers was applied to the seed-bed shortly before sowing:—superphosphate at 4 cwt., muriate of potash at $1\frac{1}{2}$ cwt., and sulphate of ammonia at $3\frac{1}{2}$ cwt., per acre. The crop grew away normally and was singled and hoed in the same way as commercial crops growing on the same farm. Close watch was kept on the crop throughout the growing season, but no serious trouble was experienced until late July, when a few beets began to show symptoms of Heart Rot, and specimen roots were submitted to Dr. W. A. R. Dillon Weston, the Advisory Mycologist at Cambridge, who confirmed the diagnosis.

The trouble spread rapidly over certain portions of the trial area, and, on August 21, all the roots on each plot were counted and the number showing obvious signs of Heart Rot recorded. The results of these counts are set out in Table 2, and the figures clearly show a large measure of control on those plots receiving 14 or 28 lb. per acre of borax. At the same time, it will be seen that very small quantities of borax are not adequate, 4 lb. per acre failing to give satisfactory control.

TABLE 2.—EFFECT OF BORAX ON NUMBER OF BEETS SHOWING HEART ROT ON AUGUST 21, 1935.

<i>Quantity of Borax. (lb. per acre)</i>	<i>Percentage of beets showing Heart Rot. (of total number on plots)</i>
0	51.2
4	42.5
14	6.1
28	5.9
Standard error	± 8.99

As the season advanced, many of the outer leaves of the beets on the plots that received 0 or 4 lb. of borax per acre turned yellowish-brown and eventually died, whilst those in the other plots maintained healthy green foliage, so that the random arrangement of the plots within the Latin square could be easily seen from the colour and amount of the foliage.

With the onset of showery weather in September, affected beets began to put out new shoots (stage 4, Fig. 1) and it was therefore decided to lift one-half of each plot at the beginning of the sugar-beet factory campaign, leaving the other half to be lifted in November, to ascertain (*a*) whether, given open growing weather in the autumn, the new foliage put out by affected roots would enable them to make up any weight lost



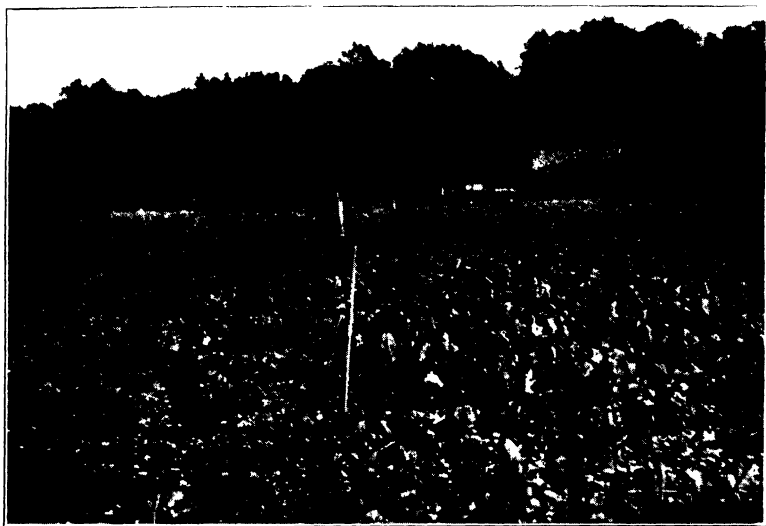
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(d) New leaves appearing.

(c) Outer leaves dying.

(b) Heart leaves dead.

FIG. 1.—Stages in the Development of Heart Rot in Sugar-Beet.

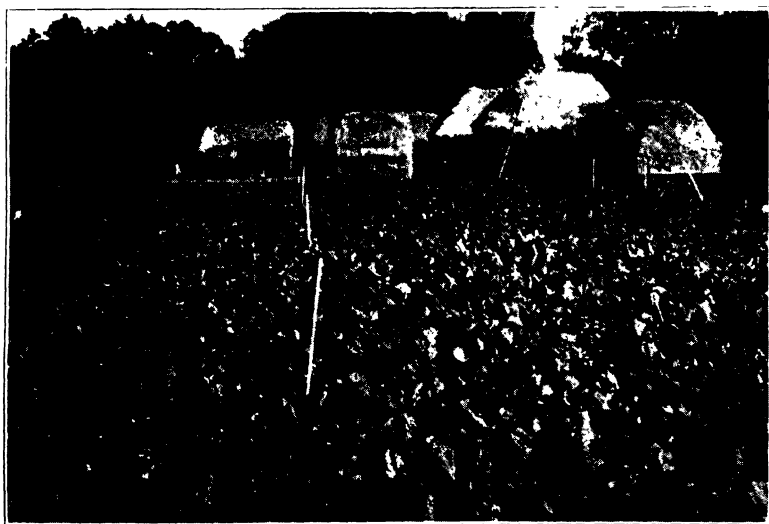


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FIG. 2 - Left side and foreground: no borax

Right side: borax at 28 lb. per acre.

(Photographed, Sept. 27, 1935)



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FIG. 3 --Left of first two sticks: 1 lb. borax per acre

Right of first two sticks: 14 lb. borax per acre.

(Photographed, Sept. 27, 1935)

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through their previous defoliation; and (b) whether such new growth of leaf late in the season would affect the percentage of sugar in the roots. The general appearance of some of the plots in the third week of September is shown in Figs. 2 and 3.

The rainfall during the growing season, as recorded at the Norfolk Agricultural Station, is shown in Table 3, together with the corresponding data for a normal season. This Station is some nine miles east of the experimental field, but the records serve to illustrate the rainfall distribution experienced in the district in the season 1935.

TABLE 3.—RAINFALL (IN INCHES) AT THE NORFOLK AGRICULTURAL STATION, SPROWSTON.

	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>
1935 ..	2.25	1.43	2.98	0.91	1.21	2.81	3.02	3.52
Normal ..	1.61	1.83	1.89	2.66	2.30	2.03	3.00	2.48

It will be seen that, in 1935, the rainfall during the early part of the season (April to June inclusive) was 1.33 in. in excess of that for a normal season, but, during July and August, when the crop is usually making rapid growth, there was a deficiency of 2.84 in.

The extent of the defoliation caused by Heart Rot can be judged from the yields of tops shown in Table 4, in which the yields of washed beet, sugar percentages, and sugar per acre at each lifting are also given.

Discussion of Results. The average plant population over the whole experimental area was 32,000 beets per acre, and though a maximum yield of only 8.2 tons per acre of washed beet on November 18 cannot be regarded as satisfactory, it must be considered reasonably good for a dry sandy soil, overlying several feet of gravel and sand, in a season such as 1935. Table 4 shows that, whilst the application of borax at 4 lb. per acre failed to give a significant increase either in yield of washed beet or in sugar percentage, both 14 and 28 lb. per acre gave significant increases over the untreated plots.

The beets on all plots made considerable growth during the autumn, the increase in the yield of washed beet between the two liftings being easily significant. Though the increase was 1.5 tons per acre on 28 lb. borax plots, as against only 0.9 tons per acre on the untreated plots, the differences between the yield increases during this period from different treatments were not significant.

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TABLE 4.—EFFECT OF DIFFERENT QUANTITIES OF BORAX ON THE SUGAR-BEET CROP.

Quantity of Borax (lb. per acre)	Washed Beet (tons per acre)			Sugar Percentage			Yield of Sugar (cwt. per acre)			Wt. of Tops (tons per acre)	
	Lifting			Lifting			Lifting				
	1st	2nd	Mean	1st	2nd	Mean	1st	2nd	Mean		
0	5.3	6.2	5.7	14.5	14.3	14.4	15.4	17.7	16.5	2.3	
4	5.6	6.7	6.2	15.0	14.9	14.9	16.8	20.0	18.4	3.4	
14	6.5	7.7	7.1	15.6	16.1	15.9	20.3	24.8	22.5	4.1	
28	6.7	8.2	7.5	16.0	16.4	16.2	21.4	26.9	24.1	4.3	
Mean	6.0	7.2		15.3	15.4		18.5	22.3		3.5	
St. Error	0.17			0.26			0.56			0.93	0.09

1st Lifting—September 30, 1935. 2nd Lifting—November 18, 1935.

Statistical Significance of Results.

Yield of washed beet :—

- (1) 2nd lifting significantly greater than 1st lifting.
- (2) Difference between 0 and 4 lb. borax *not* significant.
- (3) 14 and 28 lb. borax significantly greater than no borax.
- (4) 28 lb. borax significantly greater than 4 lb. borax.
- (5) Difference between 14 and 4 lb. borax only just fails to reach significance.

Sugar percentage :—

- (1) 14 and 28 lb. borax significantly higher than 0 and 4 lb. borax.
- (2) Difference between 0 and 4 lb. borax *not* significant.
- (3) Difference between liftings *not* significant.

Yield of sugar :—

- (1) 2nd lifting significantly greater than 1st lifting.
- (2) 14 and 28 lb. borax significantly greater than 0 and 4 lb. borax.
- (3) Differences between 0 and 4 lb. and between 14 and 28 lb. borax *not* significant.

Weight of tops :—

- (1) 14 and 28 lb. borax significantly greater than 0 and 4 lb.
- (2) 4 lb. borax significantly greater than no borax.

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Extensive growth of new foliage in the autumn frequently results in a substantial lowering of the sugar percentage, and, though no definite reduction occurred in this experiment, it is worthy of note that the sugar percentage on the untreated and 4 lb. borax plots was slightly lower at the second lifting than at the first lifting, but, in the 14 lb. and 28 lb. borax plots, there was an increase of nearly 0.5 per cent. at the second lifting.

Whilst there can be no doubt as to the superiority of 14 lb. borax per acre over 0 and 4 lb. per acre, there was much less difference between the effects of 14 lb. and 28 lb. per acre. At both liftings, however, 28 lb. per acre gave slightly heavier yields of washed beet and higher sugar percentages than did 14 lb., and though these differences were not statistically significant they suggest that 14 lb. borax per acre was not quite sufficient.

Late Application of Borax. Alongside the trial area, observation plots were arranged to provide preliminary information as to the effects of applying borax at other times during the season. One of these plots received borax at 28 lb. per acre on August 13, 1935, i.e., about two weeks after the first symptoms of Heart Rot were observed. On one-half of this plot, the borax was placed by hand on the soil near the individual beets; on the other half it was sown broadcast by hand over the whole area, some falling on the foliage and some on the soil. The borax caused no visible injury to the leaves, and the plants on both halves of this plot retained the amount and colour of their foliage much better than did those on an adjacent plot receiving no borax. In the absence of replicated plots, it was not possible to say whether such late application was as effective as borax applied to the seed-bed; but it is at least worthy of mention that the loss of foliage caused by Heart Rot was reduced by treatment applied after the trouble was observed.

Methods of Applying Borax to the Soil. In the experiments described above, powdered borax ($\text{Na}_2\text{B}_4\text{O}_{10} \cdot 10\text{H}_2\text{O}$) was used. The difficulty of distributing quantities as small as 28 lb. per acre can be overcome by *thoroughly mixing* with dry sand or sifted sandy soil. Growers who wish to incorporate the borax with their artificial fertilizers will find that effective mixing is very difficult, especially if the fertilizer is in a granulated form; also that, if borax is mixed direct with

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sulphate of ammonia, some loss of ammonia will result. If, in spite of these drawbacks, a farmer wishes to mix borax with his artificial fertilizers he should first mix the borax with the potash and/or superphosphate, leaving the sulphate of ammonia to be added last. Large quantities of boron are poisonous to growing plants and, since 28 lb. of borax per acre appears to be quite sufficient for the control of Heart Rot, this quantity should not be exceeded. Indeed, in view of the small difference between the effects of 14 lb. and 28 lb. per acre, it seems probable that a quantity of about 21 lb. per acre is all that is needed—a figure supported by the results of recent experiments in the Irish Free State.^{1*} The price of borax in 1935 was quoted at £14 10s. per ton, at which figure 21 lb. would cost approximately 2s. 9d.

The importance of uniform distribution of the borax cannot be too strongly emphasized, for careless distribution will result in some parts of the field not receiving enough borax to control Heart Rot, whilst others may receive an excessive quantity which may harm the crop. The general inclusion of borax in compound fertilizers for the sugar-beet crop cannot be recommended at this stage of our knowledge of the subject, not only because many fields do not, so far as is known, require additional boron, but also because of the wide variation in the quantities per acre of such fertilizers that are applied on different farms; should the smallest application provide adequate borax, the largest dressing might well supply more than is safe, and, alternatively, if the largest application supplies the right amount, then the smallest may easily supply a quantity that is inadequate for the proper control of Heart Rot. At the present time, it seems desirable for borax to be used only on fields known to be susceptible to attacks of Heart Rot; whether it should be mixed with the artificial fertilizer, or with dry sand, is a matter for the individual grower to decide to suit his own convenience. In view of the necessity for perfect mixing, however, the writers are inclined to favour the use of sand or dry soil so as to give about 1 cwt. of the mixture per acre. Such a quantity can be mixed more thoroughly and easily than 21 lb. of borax with 5 or 6 cwt. of fertilizer; and, if the sand-boron mixture is carefully broadcast during the early stages of the seed-bed preparations, subsequent cultivations will assist towards its even incorporation in the soil.

* For references, see opposite page.

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Information is still lacking as to the effect of boron applied to the sugar-beet crop on subsequent crops in the rotation, and also as to the need for, and efficacy of, further applications of borax when next the field is sown with sugar-beet. It is hoped to use the experimental centre, established in Norfolk in 1935, to test these points, for the fact that borax in such small quantities may affect other crops is shown by recent experiments in Scotland² and Wales³ in which, judging by preliminary results, borax applied at 20 lb. per acre has proved an effective cure for " Raan " or " Brown Heart," a new and increasingly serious trouble in swede turnips in those countries.

Growers of sugar-beet whose crops suffered from Heart Rot in the recent dry summers can guard against a recurrence of the trouble on the same field by using borax on the lines indicated above, but it is suggested that they should first consult their County Agricultural Organizer to confirm, as far as possible, the nature of the trouble. His advice should also be obtained if it is proposed to sow sugar-beet on fields with soil and moisture conditions similar to any in which trouble has been experienced in previous seasons.

The writers wish to express their indebtedness to Messrs. E. T. Sykes, M.A., and W. J. West, B.A., of the Norfolk Agricultural Station, for their assistance in the conduct of this experiment; and to Messrs. Irelands, Norwich, who permitted the experiment to be made on land at present under their management.

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THE CULTURE OF THE SOYA BEAN IN ENGLAND

Sir JOHN RUSSELL, D.Sc., F.R.S.,
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It is a great tribute to the remarkable ability of the older generation of British agriculturists that, 'in spite of the vast development of agricultural science in this country during the last 40 years, there have been few new crops introduced. Sugar-beet, wild white clover and marrow-stem kale can be partly, though not wholly, claimed for the new period; sugar-beet was, in fact, tested here in the 1870's, but given up on financial grounds, the Free Trade doctrines of the 19th century being averse to the idea of subsidies; wild white clover was all the time in our pastures, though not generally recognized and not sown. Broadly speaking, however, the crops commonly grown to-day were all established in British agriculture many years ago, and there seemed, till recently, little chance of new ones coming in.

In recent years, however, plant breeders have been able to widen the range of conditions in which a given crop can be grown. By selection and breeding, they have been able to shorten or lengthen the period over which a plant must grow before it produces seed. One of the most striking examples of the success of these methods has been the extension of wheat cultivation in western Canada. The varieties known to the early settlers, the ordinary English wheats of that time, failed on the prairies. By accident, the wheat, now known as Red Fife, was discovered, and it flourished there and laid the foundations of western Canada's wealth; but it could be cultivated only in the southern parts of the prairies. In the north, the frosts came on before ripening was completed and destroyed the grain. As a result of selection and plant breeding, varieties were obtained that required less time for seed production: Marquis was one of the first successes and later there were others; with each curtailment of the growing period, the wheat belt was pushed further north. Land that was deemed eternal waste in 1890 is now dotted with farms and homesteads.

The same process has been adopted with two fodder crops of great value in the United States: maize and the soya bean.

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In both instances, much success has already been attained, and the crops are now grown in parts of Canada where, 50 years ago, they would have been impossible.

Much important work on selection and hybridization of these crops has been done by Professor W. Southworth, formerly of the Manitoba Agricultural College and now of the Rothamsted Experimental Station. When he started work here on these crops, he was soon able to show that the new short-growing varieties would grow quite well in this country. The importance of the result lay not only in the value of existing varieties but in the proof that the methods of producing them were sound and might be hoped to give even better results in the future.

The Soya Bean: first attempts in Great Britain. In countries where it flourishes, the soya bean is a very valuable crop: in the United States, alone, some 5 million acres are grown and agricultural writers describe it in most glowing terms. Agricultural experts have at various times attempted to grow it here. Some 30 years ago Professor Hendrick tried it at Aberdeen, using Manchurian seed: in the greenhouse a few plants grew and even flowered, but they never produced seed, while in the open the seeds hardly germinated.

Farther south, at Kingston and Kegworth in the Midlands, Mr. Golding obtained better results with Japanese seed, and indeed he used the plant for some of his pioneering investigations on nitrogen fixation by leguminous plants, working with a culture supplied by Hiltner, then of Munich. Although it was useful for laboratory investigations the crop held out little promise for the practical farmer. Similar negative results were obtained by Sir Rowland Biffen at Cambridge. A summary of these tests was given in this JOURNAL in April, 1912 (p. 33). A little later, in the summer of 1912 and 1913, soya bean was tried at the Woburn experimental farm, but although the seed germinated satisfactorily and the plant grew, as in Mr. Golding's experiments, only a few pods were produced, and it was clear that the varieties tested were useless for this country. Still further south, in the old Royal Botanic Society's Gardens, Regent's Park, Mr. J. L. North, the Curator, was more successful than any of his predecessors: he began in 1914 and within a few years was growing a number of varieties and found some that ripened seed ready for harvesting in September. A brown variety

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seemed so promising that by 1929 it was taken up for further trial by the National Institute of Agricultural Botany and by Messrs. Sutton and Sons. Meanwhile Mr. North received other varieties from Professor McRostie, of Ontario, and these were included in his trials—but they all failed.

This brown variety had been obtained by Professor Southworth about 1916 at the Manitoba Agricultural College, and was fully tested and ready for distribution by 1922. It was a selection from Ogemaw, a hybrid between an early black and a dwarf brown variety produced by E. E. Evans at West Branch, Michigan, in the opening years of the present century. Like all hybrids, it is variable, and Professor Southworth's selection differed in such important respects from the parent material that it was issued as a distinct variety under the name Manitoba Brown. This was sent to Mr. North and grown by him: he described it in the *Quarterly Summary* of the Royal Botanic Gardens, for April, 1929, as having "in the course of seven years' trials here proved to be not only the most reliable cropper, but the earliest of any of the sixty varieties of soya tested by me for growth in this country for the last 14 years." Although Mr. North gives no estimate of yields he quotes Messrs. Chivers' estimate of 12 to 15 cwt. of grain per acre, and soya beans sold at that time at £13 per ton. Mr. North states also that the soya bean has been grown successfully in the Home Counties, Oxfordshire, Hampshire and the Channel Islands, but gives no figures for yields in any of these places. The National Institute of Agricultural Botany grew it in 1924, 1925 and 1926 from Mr. North's seed, and each year had a fair crop of seeds: in 1928 large plots were grown and the yield was estimated at 900 lb. per acre without inoculation and 1,150 lb. per acre with inoculation. The results seemed so promising that half an acre was sown in 1929, but the plants ripened irregularly and produced little seed. The trial was then discontinued. Messrs. Sutton also obtained some of this seed, multiplied and selected it, and described it in their *Farmers' Year Book* for that year: they stated that it had never failed to produce seed and they gave as analysis:—

Moisture	9.0 per cent.
Oil	16.7 " "
Albuminoids	38.2 " "
Carbohydrates	27.3 " "
Fibre	3.7 " "
Ash	5.1 " "

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Judging from my visits to farms and from our correspondence, a certain number of farmers (but not many) availed themselves of this opportunity of obtaining soya bean seed, but while they obtained crops, they did not find them sufficiently economically superior to existing crops to justify them in continuing, and little more was heard about the matter. Mr. North, however, was not discouraged, but continued his trials and was fortunate in enlisting the sympathy of Mr. Henry Ford, who in 1932 had purchased some 2,000 acres of agricultural land at Boreham in Essex and proceeded to sow some Michigan varieties of soya bean. These failed, but in the meantime Mr. Ford discovered Mr. North, who furnished him with the above variety and three others, and these have been grown since 1933. An account of this experiment was published last year by Miss Elizabeth Bowdidge.^{1*} Meanwhile in 1932 Professor Southworth, the originator of the most successful of these varieties, had retired from the Manitoba Agricultural College and joined the Rothamsted Staff. He started growing his best selection at the Woburn Experimental Farm.

The four varieties grown at Boreham were:—

(1) "C," which is apparently North's No. 1 Manitoba Brown (i.e., derived from Professor Southworth's selection).

(2) "J," a yellow variety that had not done well in the trials of the National Institute of Agricultural Botany.

(3) "Jap," a green variety, described as Mr. North's newest selection, and regarded by him as the most suitable for small cultivation.

(4) "O," a black variety, suitable for hay and green forage.

The crop made good growth of leaf and attracted considerable attention. The yield in 1933 was stated to be just over 10 bushels per acre (600 lb. per acre) and in 1934 to vary from 15 to 25 bushels per acre (8 to 14 cwt. per acre) according to variety, the "C" brown variety yielding best.

Professor Southworth himself has been growing the crop both at Rothamsted and at Woburn since 1934. It is unnecessary to do more than describe the 1935 experiments at Rothamsted. He used the same varieties as at Boreham, and for "C," "Jap" and "J" used the same seed, but for his variety—which is apparently identical with "C"—

* For references see page 30.

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he also used his own seed raised at Rothamsted. Of these four varieties the two Manitoba sorts, his and "C," were the first to ripen thoroughly. "Jap" came next² a few days behind, and "J" was considerably later, some pods being still greenish on October 15, when harvesting took place. At Woburn Professor Southworth's Manitoba Brown and a yellow variety named Mandarin were grown: the latter, however, failed to ripen thoroughly. The seed had been sown on April 25, 1935, which proved too early, as a spell of cold weather, accompanied by frost, severely checked early growth. The yield was estimated at 500 lb. per acre. This, however, was only half what would normally be expected at Woburn, and it shows the danger of sowing too early.

The general result of all these experiments is that Professor Southworth's Manitoba Brown and the apparently identical "C," can be grown in the south of England in summers like 1934 and 1935 and be expected to produce about half a ton of seed per acre. The samples analysed have given less oil but more protein than is obtained in the United States, the oil being about 16 per cent.³ and the protein about 38 or 40 per cent., while in the United States the oil content would be more usually about 20 per cent. or even higher and the protein content about 34 per cent. The English figures, as far as they go, are like those obtained in Ontario: the Manchurian product commonly gives values between those for Ontario and the United States. Assuming that English-grown seed sold at the usual market price of about £7⁴ per ton the return per acre would be about £3-£5, plus the value of the straw. The prospects of present varieties for seed production, therefore, are not particularly good, especially in view of the harm done to the young plant by cold weather. It happened that both 1934 and 1935 were warm above the average.

For fodder purposes the crop might prove better. Seed sown in May gives before the autumn a mass of green stuff 2 ft. or more in height, with large leaves and succulent stems. It is not ideal grazing. Canadian experience shows a preference for certain other green crops, and many varieties have a somewhat bitter taste that animals do not at first like. Both the hay and the straw are said to be good feeding materials, though we have not tried them at Rothamsted.

However, the great thing is that soya bean culture has now become more nearly possible in this country, if not yet very

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practicable, owing to the labours of Professor Southworth who produced the variety, of Mr. North who persevered in his trials against many difficulties and disappointments, and of Messrs. Sutton and Messrs. Ford who made the large-scale tests. The soya bean has such a wide range of variation between one sort and another that we can reasonably hope for the production of newer varieties that will be, from the British farmers' point of view, as great an improvement on the present Manitoba Brown as that was on the older sorts, and will make the culture not only possible but practicable. Meanwhile other pioneers may like to try their hand at growing soya beans. There are no special difficulties about soil cultivation or manuring: there is a preference for lighter rather than heavier soils, and after roots are carted off a deep surface cultivation may be sufficient preparation, but after a cereal crop ploughing is of course necessary. As the soya bean is leguminous, inoculation of the seed is desirable: cultures of the organism are obtainable from Messrs. Allen and Hanbury (3, Colts Lane, Bethnal Green, London, E.2). After well-manured roots no further manuring should be needed; otherwise, phosphate and potash may be desirable.

One most important point is the time of sowing. The Woburn experiment of 1935 shows the great disadvantage of being too early: Professor Southworth recommends mid-May as the time to aim at, though one can be a little earlier if the season or location is exceptionally favourable. The seed should be sown in rows about 24 to 30 in. apart, and spaced about 4 in. apart: on light soils, the depth of seeding may be about $1\frac{1}{2}$ to 2 in., but less on heavier soils. The harvesting presents difficulties not yet overcome: unfortunately the plants are short in the stem and the pods are carried low down, so that the ordinary grain binder is unsuitable. Small areas can be pulled by hand, but for larger areas a self-rake reaper may be possible. Unless the crop is dried in the field on tripods threshing must be done rapidly: apart from the fact that the grain is very attractive to rats and mice it readily goes mouldy in the stack. The ordinary threshing machine can be used, but will, of course, need resetting: for small quantities the seed is beaten out by hand. In regard to season Professor Southworth gives this advice. "If pioneers do begin to grow soya beans they should not be discouraged by a bad year. It is usually in the bad years that the most valuable selections are made; one naturally expects only the

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best plants to prove perfectly successful, thus the inferior plants may be weeded out and crops reproduced from the most promising plants."

The prices quoted above assume that the soya bean is going on to the market in competition with the imported product. It has so many different uses, however, that this is not necessarily the only possibility. As human food the soya bean is claimed to have many advantages: it is said to be particularly useful in cases of diabetes, acidosis and other disturbed conditions, and to constitute an attractive addition to the ordinary list of vegetables in the normal dietary. If soya beans should capture the fancy of the British housewife as completely as tomatoes have done the prospects of its culture would be considerably improved.

REFERENCES

- (1) "The Soya Bean, its History, Cultivation (in England) and Uses," Oxford University Press, 1935, price 6s. net.
- (2) Mr. North tells me that, in all his tests and those at Boreham, "Jap" ripened a week to ten days ahead of Manitoba Brown.
- (3) The oil content of "Agamaw" is given in Piper & Morse's book as 17.5 per cent.—in Canada it is usually less; Manitoba Brown received from Prof. Southworth in 1927 gave 16.69 per cent.
- (4) In "Tropical Life" for January, the price of Manchurian soya beans afloat is quoted as £7 10s. 6d. per ton on December 18 last.

A COTSWOLD EXPERIMENTAL DAIRY FARM

BLANCHE LEE GODFREY

SOME six to seven years ago, appalled at the milk we were consuming, and having some 36 acres of land available, my husband and I thought we would get a cow or two and see if we could not improve matters a little for ourselves.

First one Guernsey cow arrived, to be followed by another, and they had not settled in before a bevy of friends wanted to know if we would not save their lives by producing milk for them also! This went on for about a year, cow after cow being added to meet the demand. When it came to having to register, we thought it would be most interesting to see what could be done in the commercial line in a small way. We decided to try, avoiding all unnecessary expenditure, and buying nothing that was not well within the reach of a small farmer.

The plans were as follows: commercial cows only to be bought, but every cow to have passed the tuberculin test before being admitted to the farm: every cow to be passed by our veterinary surgeon as sound and healthy: nothing fancy, nothing expensive: local labour to be employed and fair wages paid.

Having some Brittany dairying knowledge it was settled we would sell clean milk and make sweet-cream Brittany butter. Oh! that butter! We found that even 60 lb. a week was a fairly strenuous occupation and though we sold it at 2s. per lb. it would have taken several cwt. to cope with the demand. Beside this, our clean milk round was rapidly growing.

The only fly in the ointment was the annoyance the venture gave to some of the local authorities. The whole thing was a good deal talked about, and it appeared it interfered somehow with County Council ideas. Not wishing to annoy anyone, we eventually applied to the Ministry of Health for a licence to sell "Certified" milk, and thus took ourselves out of the troubled waters. Having heard the most alarming stories of what we were going to be up against, and

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wondering if it would be out of the frying-pan into the fire, it was with the greatest pleasure that we found ourselves in a land of peace.

Our herd was of course all right from the T.T. side, and except for a new cow or two that have at different times re-acted on their second test, we have had no bother at all. It is a wicked world wherein a certain set of milk producers and retailers fatten on the story that the cow has *been* T.T. instead of that she has *passed* the T.T. and with our present laws a re-actor is not at all a difficult animal to sell, always providing she is a good milker, and though it seems very wrong, one has to let her go.

Our local sanitary inspector took samples of the milk two days running; they were submitted for analysis, the bacterial count of both proved to be very low, the farm was inspected by the Ministry of Health inspector, and beyond being requested to use hooded milk buckets (which I detest) and a cup (which everyone ought to have) for the fore-milk, we went on exactly as we were, with the exception of inventing a larger free steam sterilizer to cope with our growing rows of milk bottles.

It seems only the other day that we embarked on Certified Milk, but it is three years, and we have now such a demand for our milk sold at 6d. per quart the year round that we have had to hand over, this very week (November 15, 1935), one of our rounds to a friend who also has "Certified" Guernsey cows and 30 gallons of milk to dispose of daily. We were refusing orders wholesale, and it is not fair on the children to refuse them good milk. We now will be able to take up some of the many orders waiting for us in other parts of our district.

As to our farming methods: As already stated, all cattle are T.T., and all are isolated on arrival till thoroughly washed and disinfected. At the least sign of indisposition of any sort, at any time, the animal is isolated immediately, and our veterinary surgeon, who has helped us in so many ways, is called in. No risks of any sort are ever taken.

Some of our byres are arranged against existing walls in a court yard, and beside that we have a wooden house made to our own design. We can tie up 20 cows and the bull, and have a loose box for calving. The byres are all on the same lines, with half-open wooden fronts and canvas shutters for snow or very bad weather, and a ventilation scheme round

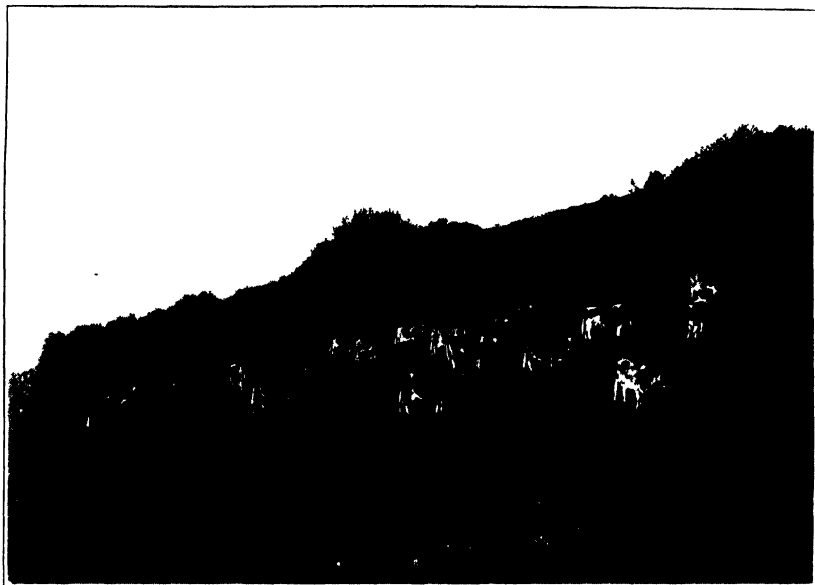
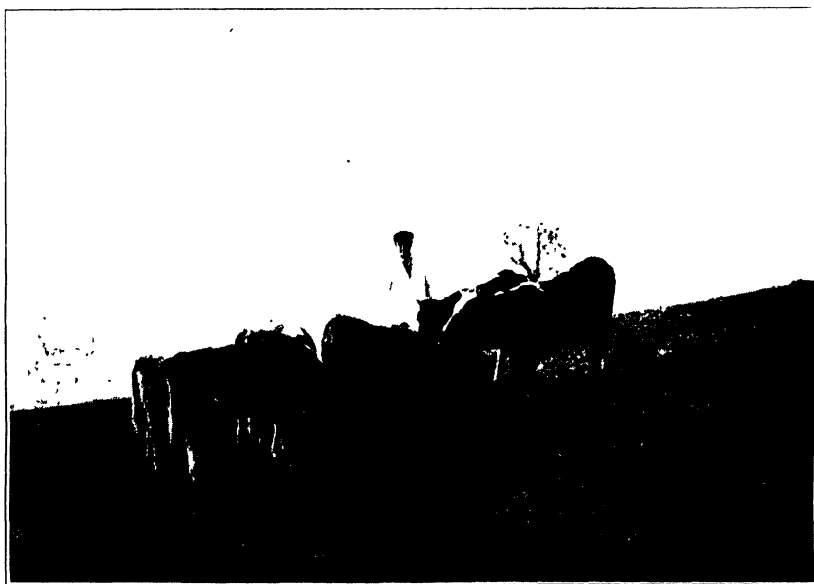


Fig 1 The Herd.



Photos Edwin C. Peckham.

Fig 2. Some of the Young Stock.

To face page 32.



FIG 3 Coming in to be milked



FIG 4 Yearling Heifers

Photos Eduin C Peckham

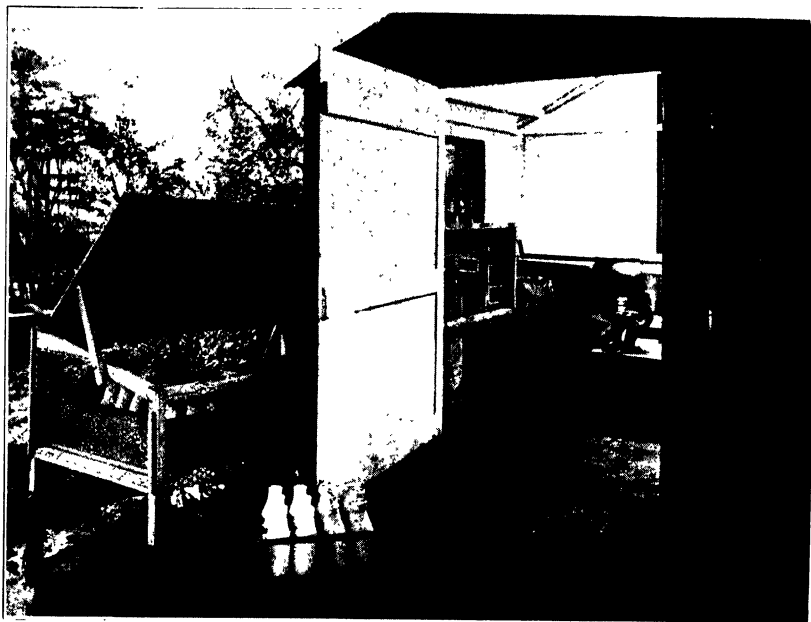


FIG. 5 The Wash House, etc., and the Cooler outside.



FIG. 6.—Washing out the Cowshed.

Photos. Edwin C. Peckham.



FIG. 7.—Interior of Cowshed.

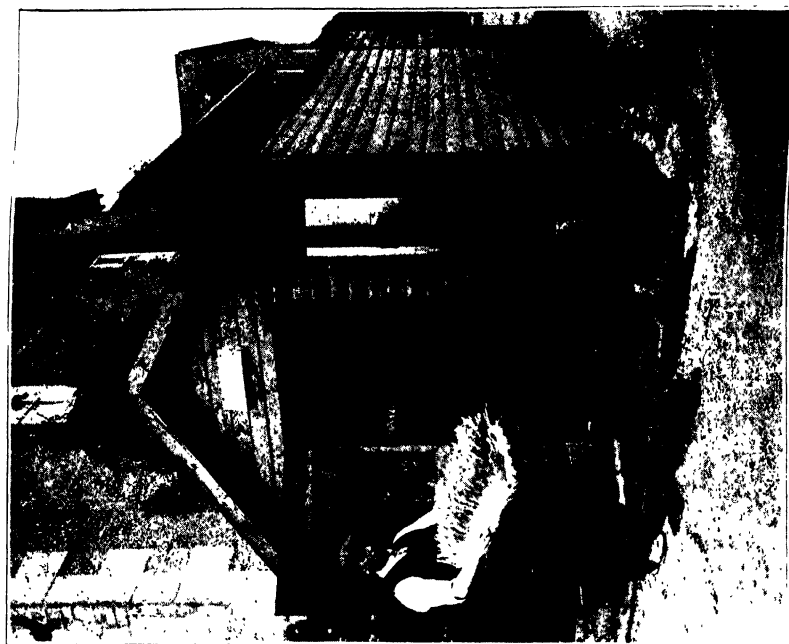


FIG. 8.—The Sprouted Maize House.
Photos: Edwin C. Peckham.

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the eaves that sends the air upwards, forming over the backs of the cows a sort of air cushion that eliminates draught.

The roofs are corrugated iron with wooden lining, and skylights at intervals. Each shed has ordinary concrete floors and gutters, and the drainage is good.

What seems to have produced surprise among farmers is that we have lined our sheds all round with 5-ft. galvanized iron. The cows stand, mostly in pairs, between strong wooden partitions covered with galvanized iron. These partitions are raised some 9 or 10 in. from the floor on stout legs embedded in the concrete. On each side of the partitions are perpendicular iron bars firmly fixed at top and bottom. Up and down these bars slide large iron rings, to which ordinary cow chains are fastened, giving a great deal of freedom to the head and shoulders but preventing the cows from horning their neighbours. Each byre has a double manger made of one sheet of galvanized iron bent to shape, and fixed on to wooden boxes. Of course, each cow has her automatic drinking bowl, and all the sheds are lighted by electricity.

The separate wooden house for six cows cost less than £50 complete. Galvanized iron reduces cleaning troubles to the minimum, and there is great comfort in knowing that, in an emergency, disinfecting can be effected from top to bottom in a few minutes.

The byres are washed daily, sides, doors, and floors with a brush and a bucket of water, with usually a drop of disinfectant added, and the saving of time and expense against the quite futile whitewashing is incredible. We have used this system (our own) ever since we started the farm, and have never had reason to wish for anything better. Furthermore, the ever increasing flow of people sent by the veterinary and sanitary authorities asking if they may look round with the object of copying, tells a tale.

Besides these sheds we have an ordinary isolation house and some outhouses for calves. The rest of the buildings are a large wooden shed with concrete floor for a food house, a tiny shelter in the yard with a running water trough, where the milk is weighed and recorded and left in closed cans to cool in the water till it can be taken up to the bottling shed to be bottled. The bottling shed is quite small, providing just room enough to house the sterilized buckets, and fitted with a galvanized iron table on which to do the bottling. Then

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there is the washing shed where all the cans and bottles are washed. This is fitted with a Free Steam Sterilizer that costs £5 15s. There is also a bottle washer (quite excellent), price only £12 10s. and a separator, the ordinary cans, crates, buckets, bottles that are found on every farm, also two large galvanized baths to soak and wash the bottles in, and some troughs of running water in a wire-covered stand in which the bottles of milk cool till wanted. This completes our outfit.

The production method is very simple. There is no clipping of the cows except under and round the udder. Every cow is washed before milking, her tail is dipped in a bucket of warm water and well lathered with soap, the flanks and quarters being thoroughly washed also. Then a second boiled cloth and clean warm water are used round the udder, a little brushing is given to her coat, and in a very few minutes the cow is clean. The tail dries out in a beautiful fluff that is the pride of the herdsman and the admiration of every farmer in the district. It takes under half an hour for the four workers to clean the 20 cows and bull.

For the milking, each milker has a clean "Coverknee" and cap, and a fore-milk cup, as well as the milking pail and sterilizable milking stool. The only difficulty we ever experience is to get, when necessary, new workers who can really milk and strip a cow—and it is so important.

Each cow's milk is weighed and recorded, and as soon as enough is available, it is carried from the cooler up to the bottling shed and put straight into sterilized bottles—quarts, pints and half pints. It is sealed and capped, and the bottles are at once put in the iron crates in the cold running water of the cooler. In the crates it later goes out on the round.

All utensils are washed in cold and hot water and sterilized for 10 minutes in steam at a temperature of 210° F. The action of the free steam gives the bottles and cans a fine polish inside and out.

A local branch of the N.F.U. lately asked through the Recording Society if they might come one day and just see the ordinary process carried out. They arrived some 40 strong (more to follow) and the general comment was "No idea it was all so easy"—"Nothing in it at all, we could all do that"—"No fuss, no nothing." We were also told that there was some sense in our cowsheds, and the cows looked beautiful, but *nothing* any of us could say would persuade

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those farmers that the cows were no better than their own; only well fed and clean. No, they were convinced that only pedigree and highly priced animals, quite out of their reach, would look like ours do!

As it was obvious that no dairy farming could pay on the average milk yield of 425 gal. per year, per cow, and as it is also quite obvious that the cow that produces only this amount of milk must be either half starved or wrongly fed, we set to work to plan out our feeding system.

We found that the cows we bought gave about 600 gal. on their first year with us, but after that easily produced 800 or 900 gal. Last year we had an average of 829 gal., this year, with four new cows in, we are below the 800. The butter fat from 18 Guernsey and two Friesians averaged 4.36 per cent. for the year.

Our feeding is quite unorthodox and I believe much cheaper than most people's. We have only 36 acres of land, reasonably good in quality, but the typical Cotswold hillside pasture, very parched in dry weather, and very wet in winter—far from ideal. For this reason the cows have to be housed at night during the winter months, otherwise one would far rather have them out the whole time. Our hay has to be bought, as besides the 20 milking cows and the bull there are young heifers, bulling heifers and calves coming on. For years we have supplemented the ordinary hay, decorticated ground-nut-cake, crushed oats, maize meal, and some dairy cake, with alfalfa meal, or, when obtainable, alfalfa chaff, in the American way, and ire and imprecations for doing so have been thrown at our heads. Notwithstanding this, the cows have flourished exceedingly on it, and produced wonderful cream and tinted milk the year round. Alfalfa keeps cows in first-class trim: you cannot beat it as a food, but it is not cheap.

Now, for over a year, we have fed our cows largely on the new sprouted maize, a wonderful invention. It can be grown at £3 per ton, and used to replace cakes and concentrates that cost £8 and £9 per ton. The maize is grown in shallow trays in water, with a little chemical dissolved in it, in a heated house for nine days. It is given to the cows about nine to ten inches long, roots and all, and is bright green and succulent. You can have a crop in nine days any time of the year, and in winter, and during drought, it is quite invaluable. There is no cutting, no hauling, no drying—just a tray lifted

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out of the cabinet, carried to the cowhouse, and the stuff pulled out and thrown into the manger. The cows adore it, it gives them the most beautiful coats imaginable, they are in excellent condition, come into calf readily, and calve down without any trouble.

Our cows also always have an ample supply of rock salt in their mangers.

It is an amusing fact that our common commercial cows, mostly bought by post, from Cornwall, are sharing honours with exalted pedigree stock in the Ministry of Agriculture Certificates of Merit scheme. One Guernsey cow gave over 1,200 gal. in the last recorded year, and several others were over 900.

The University of Bristol have costed this farm for over a year, and have requested a second year's costing, and there are Recording Society books reaching back through the years, so that statements made can be proved to be true.

The milk is tested for bacteria by the Ministry of Health twice a month in summer, less often in winter, and for our own satisfaction we test the milk ourselves at intervals by the simple means of keeping a bottleful in a rather warm place for three days. So far it has never been anything but absolutely sweet. A very annoyed customer, not long ago, complained bitterly that she wanted sour milk to make scones for a special tea party, and that the milk had "gone back" on her, as she could not get it sour!

There is nowadays much wrangling over milk matters, and one wonders why. There is excellent profit to be made by selling really good milk at a reasonable price. The cost of producing really clean T.T. milk as we do it, cannot be much, if any, more expensive than producing dirty milk, if only farmers got down to it in the right way. There is no need for very expensive plant: a £50 sterilizer may be no more effective than our £5 15s. one. It is not pressure that destroys bacteria as some people appear to think. The costly housing does not add to the cows' health or comfort, and is quite unnecessary.

It would seem as if a little common sense and tact could work wonders. How splendid it would be if counties ran their own demonstration farms where farmers could go and see exactly what needs doing: the farms to be run on commercial lines and made to pay and produce their accounts. County Instructors could show how the actual job is done. We can

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all read bulletins and books, and they are most helpful, but we don't all grasp written instructions or lectures bordering on the highly scientific.

Farmers are not as a rule very quick in the uptake, and they truly detest innovations they do not understand, or having the law laid down to them, but there are very few who, if they knew how to do it, would not be all out to give better milk to the children. The worst snag is the mixing of good and bad milk by the combines and retailers. There are quantities of beautiful milk ruined that way daily, and if only the best could be diverted for human consumption, and the rest go to manufacture, all would be well.

The easiest solution of all is for the British housewife to wake up to the dangers of bad milk, and instead of sticking to one retailer, change and change again till she obtains really good stuff. How long would it be before the dubious milk retailed and drunk at present, was no longer produced, but a first-class supply for everyone took its place?

THE BEET CROP IN NORFOLK FARMING*

F. RAYNS, M.A.,

Director, Norfolk Agricultural Station.

In the last decade, the county of Norfolk has experienced perhaps the worst depression in its agricultural history. During the same time, the agricultural index number has fallen gradually until it reached pre-war level in June, 1933. The depression in Norfolk, as in other counties, reacted on agricultural wages, which ultimately had to be fixed by the Agricultural Wages Board established by the Government.

The official statistics of Norfolk for the last ten years show a gradual reduction in the acreages of turnips, swedes and mangolds, and a very large increase in the acreage of sugar-beet. The turnip and swede acreage has been reduced approximately to one-half the 1924 acreage, and the mangold crop by nearly one-third. The combined turnip, swede and mangold acreages in 1933 were less than the acreages in 1924 by some 63,000 acres. In 1924, 7,207 acres of sugar-beet were grown in the county; last year there were nearly 100,000 acres. At least 63,000 acres, therefore, of the increased 90,000 acres of beet have been grown at the expense of the older root crops, and as the reduction in arable acreage of the county would account, on a four-course rotation, for the disappearance of about 16,000 acres of mangolds and swedes, it is obvious that the beet crop has to a great extent taken the place of the other root crops, and has been fitted into the rotation farming of the county.

The development on the small holdings was rather different in the early years of the beet crop, but recently their farms have evolved on lines similar to those on the larger farms. Besides the large acreage of privately owned small holdings, there are nearly 30,000 acres of County Council small holdings in Norfolk. On these holdings, the acreages of mangold and other root crops have not decreased so rapidly as on the larger farms. There has been a tendency for the smallholder to regard the beet crop as one from which he could obtain the full reward for his family labour. The smallholder has preferred to grow sugar-beet instead of barley, from which the gross returns at the best are no more than half of those from sugar-beet.

* Prepared from a Paper read before the Agricultural Section of the British Association at Norwich, 1935.

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Although beet on the Council's holdings increased by over 2,500 acres between 1928 and 1935, there were no reductions in the acreages of swede and mangolds; wheat, in particular, and barley, were being displaced by sugar-beet at that time.

The smallholders apparently began to appreciate the value of beet by-products for stock feeding in 1931, and much less land has since been cropped with roots; in fact, despite the addition of 2,000 acres to the Council's holdings since 1928, the total root crops were reduced by 200 acres in the three years 1931-34; in the same period 2,120 more acres of beet were grown and 1,200 acres less barley. Previous to 1931, wheat had decreased very considerably, but regained the 1925 acreage in 1934. In 1934, 19.5 per cent. sugar-beet, 6.6 per cent. other roots, 7.2 per cent. potatoes, were the respective proportions of the root crops to the total land owned by the Norfolk County Council.

In the greater part of Norfolk, therefore, the roots and not the cereals have been replaced by sugar-beet, and a revolution in farming practice, comparable with that made possible by the use of turnips during the 18th century, is taking place in Townshend's native county. In a little more than ten years, the pivot of Norfolk arable agriculture has changed from a root crop grown for stock feeding to a root crop grown for cash, and a new system of stock feeding has developed.

The Old Order. For over 100 years, the County of Norfolk was mainly farmed upon the four-course rotation. Receipts were from cereals and live stock sold during the winter and spring. The only exceptions were the farms producing fat or store lambs, from which some receipts came in from Easter onwards. Thus, there were long periods in the year when there were no receipts and great reliance was placed upon the livestock policy, for the association of "horn and corn" was regarded as the essential feature of the system; in fact, the financial success of half the farm (the roots and hay shifts) depended on the stock policy which, even if it failed, was excused because of the "good it did the land" and the fine crops of cereals that it grew. Those sentiments were excellent in profitable times, but they were likely to lead to a fool's paradise when things went wrong; and they did go seriously wrong for arable farmers from 1920 onwards.

The development of the beet crop after the War was opportune. It brought in cash in the early part of the autumn, just when it was necessary to buy sheep for the folds and

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store cattle for the yards. The factories were also prepared to make financial advances on the growing beet crop as early as July. How different this was from the mangold and swede which brought in nothing until the sheep and bullocks were sold in early spring! Beet was grown on contract; it was not speculative—it was sold before it was sown, and it was obvious that the better the job was done the more profit would result. In contrast, a big mangold or swede crop could become a positive embarrassment. The heavier the mangold crop on a feeding farm, the more bullocks had to be bought to eat the roots. Thus, if the beef trade was bad, a fine crop of roots became a financial burden. Such arguments could only lead, as they did, to increased beet cultivation.

It is true, of course, that beet did not appear to be so easy to grow as mangolds; the rows were narrower and more labour was necessary for cultivation. If roots were displaced, the supply of home-grown feeding stuffs would be reduced, and it became possible that the supply of farmyard manure would also be decreased. These were the early apprehensions of Norfolk beet growers; they were afraid they would be unable to obtain extra labour to clean and harvest the beet, and they feared that reduced roots and increased beet would not enable them, in their own words, "to jam the straw" into manure. Early prejudices against the crop were dispelled, however, as experience accumulated, and modifications, similar to those given for the farm in the next table, were soon in evidence.

CROPPING AND STOCKING OF A FARM OF 166 ARABLE ACRES

Year	Roots for Stock	Sugar	Beet	Pulp		Head of	
	Feeding acres	Beet acres	Tops Fed acres	Wet tons	Dry tons	Sheep	Bullocks
Average 1926 & 1927	22	7½	Nil	Nil	10	100	46
1931 ..	11	25	22	Nil	10	52	54
1934 ..	3	30	8	120	10	50	55

The change has not always been so complete as on this particular farm, especially on the dairy farms, where beet tops have caused trouble in tainting the milk, but it indicates the general trend of the development, and shows that rotation farming around the beet crop is possible, and that all the stock traditionally associated with the supply of farmyard manure may be maintained on beet-growing arable farms.

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In fact, it is probable that the continued spread of the beet crop in Norfolk has been stimulated as much by this appreciation of the crop as a mangold or swede substitute as by any other factor, although agricultural depression and, in particular, the poor trade for winter-fed beef have caused many farmers to sign beet contracts.

There is no doubt at all concerning the suitability of the climate of Norfolk for beet growing; possibly the climate of the Western European countries is the most suitable one for beet cultivation, as undoubtedly the best sugar-beet crops in Europe are grown in the continental countries nearest to Great Britain. The crop continues to grow in Norfolk in most years until at least the middle of November; from September to November it may increase by 2-3 tons per acre. It is doubtful whether such advantages exist in any other beet-growing country. In Norfolk, it is not only a question of the increased weight that follows late autumn growth, but fine autumn weather greatly assists the harvesting of the crop, makes carting easier and prevents damage to the soil texture during the process: it also helps to preserve the feeding value of the beet tops.

Live Stock Feeding. When beet growing began in Norfolk, about 150,000 acres of mangolds and swedes were grown. The yield of Norfolk roots is not very high—the average for the last ten years being 12 tons per acre of swedes and 17 tons of mangolds. These, however, sufficed, with hay and concentrated foods, to feed fattening bullocks during the winter at the rate of about two to the acre of roots, assuming that it takes twenty weeks to fatten a bullock on a ration of 112 lb. roots per day. Sufficient roots were, therefore, provided on the old four-course rotation for feeding 300,000 bullocks each winter with the addition of hay and concentrates.

To what extent would the by-products of the sugar-beet industry replace 150,000 acres of stock-feeding roots? In feeding trials at the Norfolk Agricultural Station, with 80 bullocks and 140 sheep, it was shown that beet tops in practice did not attain their theoretical feeding value, but that 1 ton was equal to 0.93 tons of swedes when fed to the bullocks, and to 1 ton of swedes when fed to the sheep. In the trials, tops in the best condition were used. In practice, however, the tops vary in value according to the weather, deteriorating in yield and quality when it is wet or frosty, or after a long period of exposure. It is not easy, therefore, to ensure that

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they are fed without wastage either to horned stock or to sheep, and there is some difficulty in determining what may be called the "effective yield" of beet tops. It is probably unsafe to assess their value as stock feed as high as half a crop of swedes. Usually, it is better in practice to rely upon a rather lower value for safety.

Similar trials have been made with dry beet-pulp, the yield of which is about half a ton from an acre of sugar-beet or sufficient from two acres to provide root substitutes for one bullock, a ton of beet pulp being equivalent in feeding value to about 8 tons of swedes. Feeding trials have repeatedly demonstrated that stock fatten quite as quickly—in fact rather more quickly on beet pulp than on roots, and the quality of the meat is in no way impaired, the only obvious feature being a tendency for the fat of pulp-fed cattle to be white instead of yellow, which is no detriment.

Therefore the beet crop leaves behind by-products that are effective substitutes for roots in the fattening of $1\frac{1}{2}$ bullocks to the acre, or for approximately 150,000 bullocks from the present beet acreage. To express the same thing in another way: the complete replacement of 150,000 acres of the roots in Norfolk by beet would only reduce the quantity of stock-food grown on the root shift by one-quarter. The food value of molasses has not been taken into consideration in the calculation. Complete replacement of the root crop, however, is not likely to arise, because the production of sugar in Great Britain has now been limited, but if it did arise it would not be a serious matter in Norfolk. It would actually increase the county's contribution to the nation's food supply, for the food value obtained from sugar-beet in the form of sugar-beet pulp, molasses and beet tops is considerably greater than that from the county's average yield of swedes or mangolds. There is, however, an appreciable reduction in the quantity of home-grown food available for stock feeding, for the sugar is, of course, used for human consumption. The number of livestock kept in Norfolk, however, has not been affected, because, as is well known, foods other than beet by-products may be used as root substitutes. The agricultural returns show that there were more cattle and sheep in Norfolk in 1934 than in 1924. There are interesting changes to note in sheep- and bullock-feeding practices.

Most Norfolk fattening yards had no water laid on, a ration of $1-1\frac{1}{2}$ cwt. of roots daily providing all the water required

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by the largest bullock. On farms where roots were displaced by sugar-beet, it became necessary to put a water supply into the yards, for dry pulp has to be fed soaked, while beet tops not only contain much less water than roots, but are a sweet and thirst-producing fodder. Usually the tops are used in the fresh state before Christmas and dry or wet pulp afterwards, although there is no invariable rule. As yet, there is little ensiling of beet tops in Norfolk, and often the new and old practices—the beet by-products and the roots—are combined in the feeding of all kinds of stock.

The labour of feeding cattle on beet tops or beet pulp is appreciably less than when roots are a large part of their diet.

Flockmasters, too, have come to rely upon beet tops for the pre-Christmas feeding of both the fattening hoggets and the ewe flock.

The white turnip is no longer important in Norfolk sheep-feeding, and the time is not far distant when it will almost disappear from the Norfolk landscape. It has been replaced by beet tops, which are commonly relied upon for sheep feed from October to early January. In winters free from frost or excessive rains, beet tops may be folded as late in the year as early March. Obviously, beet tops have been of great assistance to sheep feeders, and it is not too much to say that the introduction of the beet crop has preserved many arable flocks in Norfolk. This association of beet and folded sheep may also enable beet to continue to be grown at the present prices on the lightest soils—on soils that might otherwise go out of cultivation.

Condition. Land that will grow sugar-beet has become one of the chief concerns of tenants seeking new farms in all parts of Norfolk, and the landlords fully appreciate the value of the crop in maintaining a high state of cultivation. It used to be said that beet was a "bad landlord's crop"; such expression of opinion is no longer advanced. If it were, it would not be in accord with either farming experience or the results of experimental work, which has measured the effects of the beet crop upon the remaining crops in the rotation. The results of trials, carried out on three separate four-course rotations, illustrate the residual effects of beet tops (*see* Table top of p. 44).

The value of beet residues, as manure, is chiefly confined to the first two crops after the beet: apparently it does not persist into the third crop. In a four-course rotation of beet,

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GRAIN AND HAY YIELDS PER ACRE—MEANS OF YIELDS OF CROPS IN
THREE ROTATIONS (Norfolk Agricultural Station)

	<i>Hay: Dry</i>		<i>Barley</i>		<i>Wheat</i>
	<i>Barley</i>	<i>Matter</i>	<i>Wheat</i>	<i>Straw</i>	<i>Straw</i>
	bus.	cwt.	bus.	cwt.	cwt.
Tops carted off	38.9	37.8	40.6	18.9	23.5
Tops ploughed in	47.2	41.9	40.0	25.7	23.6
Tops sheeped	48.0	40.7	43.6	25.5	23.6
Increase due to ploughing in the tops	8—9	4	Nil	7	Nil

barley, hay and wheat, the barley yield is increased by 8 or 9 bus. per acre and the hay by about 4 cwt. of dry matter per acre. The appreciation of the feeding and manurial values of beet tops has done much to maintain the beet crop in the county. In many instances, especially on the light soils of S.W., N. and N.W. Norfolk, there has been no profitable alternative in the root shift to beet-growing: it has been a case of growing beet and keeping the flock or turning the land into bad grassland sheep walk, or adopting continuous corn-growing by power methods. On the lightest soils of Norfolk there is no question which is the best policy; it is clearly the one based on sugar-beet and the arable flock. Incidentally, attempts are being made to combine power-farming cereal production with sugar-beet and arable sheep. The combination, without horned stock or dung, seems much more likely to be successful than the more usual sequence on those farms of two corn crops, a fallow and a green manuring.

Labour. Statistics show that the number of workers in Norfolk has gradually been reduced with the decrease in arable acreage and farming prosperity, despite the concurrent increase in the beet acreage. Perhaps the chief factor in determining the extent to which labour is employed in agriculture is the general prosperity of the industry and the confidence the farmer has in the future, and is not the absorption of labour by any particular crop. This point is well illustrated by the following table compiled from the June agricultural returns for Norfolk.

	<i>Acres Arable</i>		<i>No. of Regular</i>		<i>Agricultural</i>
	<i>Thousand Acres</i>		<i>Workers</i>		<i>Index No.</i>
1924	765	..	41,159	..	158
1925	758	..	42,616	..	155
1927	746	..	41,908	..	141
1929	731	..	42,239	..	140
1931	719	..	37,358	..	123
1932	707	..	37,729	..	111
1933	698	..	41,271	..	100

THE BEET CROP IN NORFOLK FARMING

From 1924 to 1931, the number of workers employed in farming in Norfolk fell rather more slowly than did the arable acreage. As 1932 approached, the various agricultural schemes, nebulous as some of them were at that time, suggested that the future would be brighter and a more hopeful farming outlook developed. There was an immediate increase in the number of workers, although the agricultural index number continued to fall for the next two years.

It is not easy, however, to deduce from the official statistics the exact influences of the beet crop on the extent of labour employment, but there is, on the other hand, no difficulty in indicating those effects on individual farms. Beet is a crop eminently suited to piece-work arrangements and it is not uncommon for men to earn 45s. to 50s. per week during the hoeing and lifting of the crop—the minimum statutory wages in Norfolk being 31s. 6d. per week.

A number of instances have been recorded on Norfolk farms of the increase in the total wage bill as the acreage of beet has been increased. A good example is from a 400-acre arable farm in the Breckland area, around which there is much derelict land and afforestation.

EFFECT ON WAGES OF INCREASED BEET ACREAGE						
<i>Means of Years</i>			<i>Acres of Beet</i>		<i>Farm Wages Bill</i>	
					£	
1923-24	16	..	1,483
1925-26*	38	..	1,739*
1927-28	69	..	2,165
1929-30	82	..	2,015
1931-32†	58	..	1,857
1933	110	..	1,944

* In 1925, agricultural wages were increased.

† Successive farm losses in previous years caused drastic economies in labour, which became less necessary in 1933—a more prosperous year.

A number of similar instances could be given.

It is sometimes argued that beet has casualized the agricultural labourer, because the number of casual workers in Norfolk has increased during the last ten years. When farming is profitable, farmers are prepared to find work for their men during the slack times of the year, but if conditions are not so good there is, as in all businesses, a tendency to stand the men off during the less busy periods.

Norfolk farmers have undoubtedly been forced, unwillingly in most instances, into these practices. A more potent factor, however, in casualizing farm workers has been the reduction in arable land, which alone would account, according to the

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usual rate of employment on arable farms, for 2,000 men losing their jobs, the total reduction of regular workers over the same period being 3,430. The men so displaced either obtained no agricultural employment or became casual workers. It is probable that they contributed largely to the casual workers and were ultimately absorbed by the seasonal labour requirements of the beet crop. There is some substantiation of this last statement by reference to the figures for seasonal relief workers under the Norfolk County Council, for after the disastrous farming year of 1930-31 it became necessary for the local authority to provide relief work for the men displaced from the land. It is estimated that about 90 per cent. of the 3,000 unemployed men at the peak (usually reached in April) are agricultural workers. It will be observed from the following table that during corn harvest and the hoeing and harvesting of the beet crop the number of relief workers becomes negligible (July-January).

THE SEASONAL FLUCTUATION IN THE NUMBERS ON RELIEF WORK IN NORFOLK—AVERAGE ON 1ST OF EACH MONTH, 1930-35.

<i>Number of Men on County Relief Work.</i>					
April	..	..	2,820	October	.. .. 420
May	..	..	2,330	November	.. .. 370
June	..	..	1,570	December	.. .. 500
July	..	..	280	January	.. .. 1,130
August	..	..	100	February	.. .. 2,380
September	..	..	350	March	.. .. 2,680

There has been little agricultural unemployment in Norfolk when there has been work in the beet fields, which, in itself, has been sufficient to absorb the labourers who have lost their jobs either through the continued decline in the arable acreage or through the necessary economies due to farming losses.

There has also been a considerable increase in road traffic during the beet-lifting season, and at one factory alone as many as 479 vehicles are employed in carting beet. As there are three beet factories in Norfolk, and the largest factory in the country is just over the Norfolk borders at Bury St. Edmunds, receiving much Norfolk beet, there is obviously a very large number of vehicles on Norfolk roads as a result of the beet sugar industry. At least half the beet is now delivered by road to two of the three Norfolk factories.

There have been other ramifications of the beet crop. It has influenced the industries allied to agriculture and has had profound effects on the prosperity of the small towns in Norfolk; deeper and much improved cultivation of the land

THE BEET CROP IN NORFOLK FARMING

has developed; a more progressive farming outlook has resulted from studying the cultivation of a new crop; and farmers have become more tolerant and responsive to progressive methods. It is no exaggeration to say that the fortunate development of the beet crop has saved the post-war agriculture of Norfolk, although it is impossible to offer statistical proof of the statement. Despite the successes, however, British beet growers have had many anxious moments in the short history of the crop, but none so anxious as those during the uncertainty following the recent Greene Report. The subsequent decision of the Government was a matter of such vital importance to the county of Norfolk that no one outside the beet industry can possibly appreciate its significance.

[Note. Some of the data in this article were prepared by my Colleagues, Mr. T. G. Ellis, F.S.I., Mr. H. J. Harrison and Mr. J. C. Mann, M.A. Their co-operation is gratefully acknowledged.]

TOMATO SICKNESS IN YORKSHIRE

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THE importance of various strains of the eelworm, *Heterodera schachtii*, in relation to diseased conditions of certain cultivated crops is now fully recognized. Potato sickness is very widely spread and well-known in the large potato-growing areas, and, recently, Petherbridge¹* has shown that beet sickness associated with infestation by the beet strain of the same eelworm has now made its appearance in this country. Up to 1935, however, no published British list includes the tomato as a host susceptible to injury by this eelworm, although Morgan² was able to induce experimentally a very slight infestation by growing tomatoes in potato-sick soil. In Yorkshire, however, 32 cases of infestation of the tomato crop have been observed since 1928. In July of that year one of the writers investigated a partial failure of a tomato crop, finding the plants heavily infested by the eelworm. Since that time, the number of cases of tomato sickness associated with eelworm attack has steadily increased in this county; and, last year, a light attack in Lancashire was recorded by Miles.³ It is now obvious that the possibility of trouble arising from the eelworm has become an important factor to be faced by tomato growers. On this account, therefore, it is felt that a brief account of observations of the problem, made in Yorkshire, should be recorded, especially in view of the increase in tomato culture in the county.

Distribution of the Eelworm. Records show that a majority of cases of eelworm infestation occur in the East Riding of Yorkshire, but attacks have also been noticed in various centres in the West Riding and also in parts of the North Riding. It is significant that the East Riding possesses large areas of land, both on the sands and on warp soils, which are heavily infested by the potato strain of *Heterodera schachtii* and on which, as Strachan and Taylor⁴ have pointed out, potato sickness has been a serious trouble for many years. In the Middlesbrough area, and in many parts of the West Riding, potato sickness is very prevalent.

For the purpose of this account, the Yorkshire tomato

* For references see p. 54.

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growers can be divided into three categories. The first type is the grower who does not change the soil in the house more than once in four or five years. Given an initial eelworm infestation, this procedure is obviously likely to lead to eelworm and other troubles. Cases of this kind have been met with, in which eelworm infestation of the soil and of the plants grown was very severe.

The larger commercial growers, who use heated glass-houses, particularly those also engaged in the rhubarb industry, change the soil for tomato culture frequently. In spite of frequent changes of soil, infestation of tomato crops occur, accompanied in many instances by serious tomato sickness. It should be pointed out that growers in the county are only just beginning to adopt the practice of steam sterilization.

There is also an increasing number of growers in the East Riding who are using the Dutch type of cold glasshouse shown in Fig 1. The type of house erected consists of a wooden framework covered with glass lights of the Dutch pattern. The lights are easily removable and are used in the spring for the frame culture of vegetable and salad crops. Several such growers during the present season have experienced severe losses associated with eelworm infestation in the tomato crop.

The Nature of the Attack. The symptoms of the tomato sickness associated with eelworm attack are on the whole similar to those of potato sickness. As in potato sickness, the trouble frequently occurs in patches, and, if the soil is unchanged, these grow larger during subsequent seasons. Tomato plants, if raised in eelworm-free soil before they are planted out, make good progress at first; but, usually about three weeks after planting out, begin to show signs of sickness. Their growth is retarded, the plants exhibit severe wilting symptoms and, although they may survive, aided by frequent heavy watering, they rarely attain a height of more than 4 ft. Severe rotting of the roots occurs and the plant produces a mat of roots above the original ones. As with potato sickness, cysts may be observed bursting through the surface of infested roots. A very striking feature of the attack is the effect on the blossom, many flowers failing to open and either dropping off or failing to set, with consequent reduction in the yield of fruit.

TOMATO SICKNESS IN YORKSHIRE

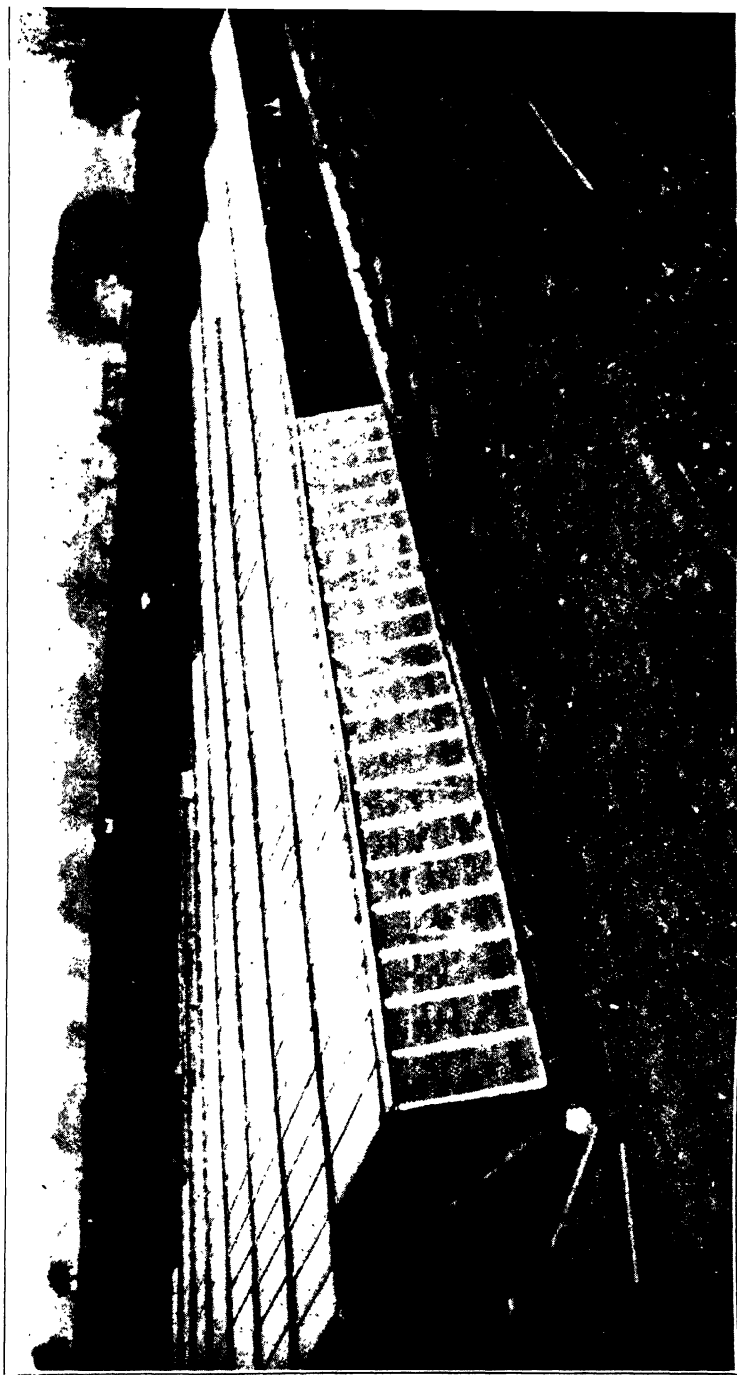
It is worthy of note that the cysts of the tomato strain fall from the roots more easily than with the potato strain. A badly-infested piece of root from which the cysts have fallen is pitted with cavities from which the cysts have been dislodged.

The cysts of the tomato strain are similar in shape to those of the potato, although preliminary measurements indicate that they are slightly smaller.

During the past season instances were also observed in which the seedlings had been raised in eelworm-infested soil. Such plants, being attacked from the very beginning, show very poor rootage and are stunted and starved in appearance. When these seedlings are planted out in eelworm-free soil, they may succeed in producing a good root system and make good growth. Fig. 2 shows two seedlings left in the original bed and a typical plant of the same age showing recovery after planting out. It should be noted, however, that although such plants recover they are infested by the eelworm and therefore are introducing the eelworm into clean soil.

A third kind of trouble is typified by a holding on which an acre of arable land was enclosed under a Dutch type of glasshouse for the first time during the winter 1934-5. Healthy seedlings were planted out in mid-April and, three weeks afterwards, many of the plants showed signs of root trouble, growth being arrested, the foliage wilting so that by early June one-quarter of the area carried dying or dead plants. Examination of the roots revealed heavy eelworm infestation, and large numbers of white cysts were just bursting through the surface of the roots. Slight infestation of the roots also occurred on plants from apparently healthy areas. It should be emphasized that the enclosed area had carried potatoes three years previously, and numerous brown cysts were present in the soil between the plants. The soil outside the holding also proved to be infested by eelworm cysts.

On the same holding, a second house, erected a year before, had produced, in 1934, a healthy crop; but, during the current season, showed scattered areas of sick plants and, again, the rotting roots of these plants were heavily infested by the eelworm. On July 1, 1935, the sick plants in these houses were, at the most, 2 ft. in height, and yet, in the second house in healthy areas, some of the plants which had been planted four weeks later than the sick plants had attained a height of 4 to 5 ft.



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FIG. 1.--Dutch Glasshouse in Course of Construction.



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FIG. 2.—*On left* : Infested seedling growing in celworm-free soil.
On right : Infested seedlings, of same age, from seed-bed.

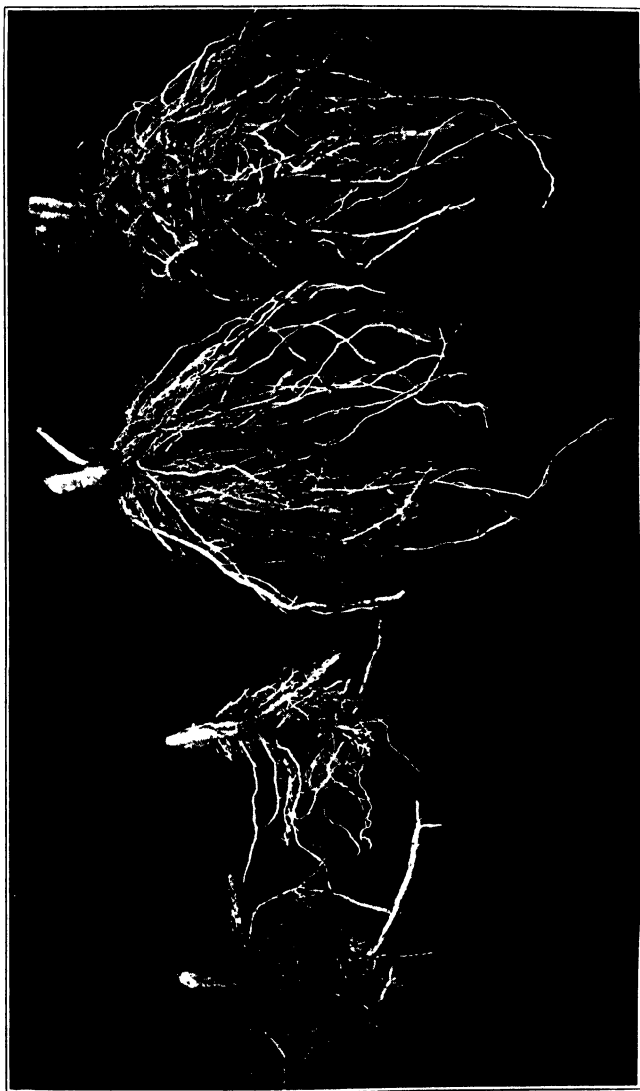


FIG. 3. *On left* : Roots from untreated plot.
On right : Roots from plot treated with mercuric chloride.

Copyright: Leeds University.



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FIG. 4.—Tomato rootlet, showing entry of young celworms ($\times 130$).

TOMATO SICKNESS IN YORKSHIRE

Control Methods. During the past seven years various methods of preventing tomato sickness have been tried; and, of these, three methods are mentioned below.

1. *Layering of the Plants.* Where eelworm attack has occurred in small patches, complete failure has been prevented by digging out the soil immediately around and underneath affected plants and replacing it by fresh eelworm-free soil into which the sick plants were layered. The new rootage induced by this operation enabled sick plants to make fair growth.

2. *Mercuric Chloride.* Trials with mercuric chloride for the prevention of potato sickness have been carried out in Yorkshire by one of the writers.⁵ During the season 1932, trials of this substance against tomato sickness were carried out in a small house, the soil of which was heavily infested by eelworm cysts and in which the tomato crop had failed the previous year as a result of tomato sickness. The grower had not changed the soil for four years, and during that period his crop had grown progressively worse. Flower culture was the major interest of this grower, and he used tomatoes as a kind of catch crop during the period April to September. The experimental bed having been prepared, it was divided into small plots each large enough to carry nine plants. The plots were treated as shown in Table 1, the mercuric chloride being applied as a solution at the rate of 1 gal. per sq. yd. The variety *Kondine Red* was planted out a fortnight after treating the beds; and as the fruit was picked the weight was recorded and the price obtained was also noted. The results are given in Table 1. The general effect of the treatment was highly beneficial.

The severe wilting suffered by plants on untreated plots was largely prevented on treated plots. This feature was reflected in the growth of the plants. All the control plants bore poor blossom trusses and none of them attained a height of more than 4 ft. The treated plots produced much more vigorous growth, the average height of the plants at the end of the season was about 6 ft., and the yield of fruit was markedly higher on treated plots. At the end of the season, the roots of the plants were lifted for examination. Fig. 3 shows typical roots from control plots and from a plot treated with 1 in 250 mercuric chloride solution. The difference in rootage is obvious. The untreated roots were almost completely

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rotten and cysts were easily detected on them, whereas roots from treated plots were healthy and only odd cysts were found.

TABLE 1.

Plot No.	Treatment.	Yield in lb.	Price obtained.
3 }	Nil.	8	3/6
8 }		5½	3/3
5 }	1 in 500 Mercuric	16½	9/11
10 }	Chloride.	11	5/3
4 }	1 in 350 Mercuric	14½	8/9
9 }	Chloride.	11	6/8
2 }	1 in 250 Mercuric	14	6/11
7 }	Chloride.	14½	8/4
1 }	1 in 150 Mercuric	12	6/3
6 }	Chloride.	16½	10/0½

3. *Steam Sterilization.* The practice of steam sterilization is gaining favour among the larger growers, and has been found to be the best method of controlling the eelworm. The case may be quoted of one grower, for example, who had failed to prevent severe eelworm injury in spite of changing his soil every third year and giving annual formaldehyde treatment, but who steam sterilized during the winter 1934-35, using the "Harrow" method.⁶ His crop during the past season was by far the best produced by him for many years. No infestation was observable on the roots, and, of the cysts collected from the house down to a depth of 18 in., all were killed, whereas cysts collected from the soil outside the houses were found to be still viable.

Discussion. Several important points emerge from observations recorded in Yorkshire. In the first place, there is obviously a very real danger of eelworm infestation of tomatoes grown in areas of the county where potato sickness is prevalent. The occurrence in Yorkshire of heavy eelworm infestation on tomatoes grown for the first time in potato-sick soil serves to emphasize this point. Laboratory experiments have confirmed that the potato strain of the eelworm is capable of infesting the tomato. Tomato plants, planted in pots containing soil heavily infested by potato eelworm cysts, suffered severe eelworm infestation. During the sixth week after planting out, for example, roots were showing such large numbers of larvae penetrating the rootlets that in a piece of root one and a half inches in length ten such larval eelworms were counted. Fig. 4, from a photomicrograph, shows larval eelworms in the act of penetrating a rootlet.

The routine practice of steam sterilization is undoubtedly

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the only completely satisfactory method of treating the soil in large potato sickness areas where good eelworm-free soil is difficult to obtain.

It has already been indicated that, in the East Riding of Yorkshire, the increasing number of growers who adopt the cold Dutch house method of tomato culture is faced with the possibility of severe tomato sickness even during the first season. It would appear that it is essential that growers who adopt this system should make sure that the soil is free from eelworm infestation before erecting their houses on fresh ground. Since the Dutch type house, already referred to, need not remain permanently on the same site, growers who use them are less likely to adopt steam sterilization, especially as the financial returns are comparatively low from unheated houses, the crop from which misses the early market. The fact remains, however, that these growers will continue to find it difficult to find an eelworm-free site and to prevent the incidence of the parasite unless steam sterilization is adopted. It has been estimated by one grower that the cost of dismantling, removing and re-erecting on a nearby site a Dutch house enclosing one acre would be approximately £120. Our colleague, Mr. Hudson, estimates that steam sterilization of such an area, would be, at the most, £150 per acre, including hire of boiler and apparatus. Provided the grower determines to continue to grow tomatoes under this system, it would appear that steam sterilization is the better solution of the problem.

It is equally important that growers who adopt the more usual greenhouse practice should make sure that any soil they use is free from the eelworm. It is not safe for growers to assume that soil is free from eelworm infestation because it has not carried a potato crop for seven or eight years, since the writers have met with a number of instances where viable cysts of the potato strain were still present in fields that had been rested from potatoes for a period of ten years.

Blenkinsop,⁷ in referring to potato sickness in Devon and Cornwall, states that in some soils potato sickness can be prevented in spite of heavy eelworm infestation by the application of heavy dressings of potassic fertilizer to rectify a low potash-phosphoric acid ratio. It is of interest, therefore, to note that cases of tomato sickness have been observed on holdings on which it is a common practice to apply dressings of sulphate of potash amounting to two tons per acre.

TOMATO SICKNESS IN YORKSHIRE

The fact that tomato sickness is widespread in Yorkshire, and that Miles has recently observed infestation by *Heterodera schachtii* on tomato in Lancashire, suggests that trouble from this pest may become more general unless proper precautions are taken.

Acknowledgements. The writers desire to express their thanks to Mr. C. E. Hudson, N.D.H., for bringing cases to their notice, and for his advice with regard to steam sterilization; to Mr. S. Burr, for assistance with the earlier control experiments; and to Mr. A. W. Bean for the photograph of his glasshouse.

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MARSH SPOT IN PEA SEEDS: IS IT A DEFICIENCY DISEASE?

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In an article published in this JOURNAL for December, 1934,^{1*} an illustrated account of the trouble known as Marsh Spot in pea seeds was given. In this, the previous literature was reviewed and the results of some experimental work were described. Reference was made to field studies then being pursued, with the South-Eastern Agricultural College, Wye, Kent, as headquarters, and the results of these studies have recently been published by Furneaux and Glasscock.² They indicated that the occurrence of Marsh Spot was correlated with the presence of a water table in the soil, a high percentage of affected seeds being met with only in crops grown on fields having a water table within 52 in. of the surface. The effect of the water table may be modified by soil texture, and it was found that soils of a light texture carried crops with the least average incidence of Marsh Spot, while those of heavy texture carried crops with the greatest average incidence. Important deviations from this rule were, however, met with, and it is not safe to conclude that water table and soil texture by themselves cause Marsh Spot, though they may be contributory factors.

Work on the problem has also been continued in Holland, and an account of this was recently published by A. Ovinge.³ As a result of the examination of 237 samples of pea seed, collected from all parts of Zeeland in 1934, it was found that the trouble was more prevalent in polders reclaimed after A.D. 1700 than in those reclaimed in previous centuries. The results also showed that some varieties were less susceptible than others. Thus, whilst the variety Zelka showed a mean infection percentage of 7, Mansholts and Glory showed 13 and 21 respectively. It also appeared, although not very strikingly, that early sowing favours the development of Marsh Spot; but no correlation between the nature of the previous crop and degree of Marsh Spot attack was found.

* For References, see p. 58.

MARSH SPOT IN PEA SEEDS

The prevailing idea that Marsh Spot is more common on heavy than light soils was confirmed, but ordinary artificial fertilizers appeared to exert no specific influence. The question of soil acidity was also taken into consideration, and there was an indication that Marsh Spot was more intense in alkaline than in acid soils; but the matter requires further investigation.

The only other publications noted in connexion with Marsh Spot during the last couple of years are, first, an illustrated note by Wade and Zaumeyer,⁴ recording the occurrence of what is evidently our Marsh Spot in pea seeds in California, and, secondly, an illustrated note by Orton and Henry⁵ on a somewhat similar type of trouble found in bean seeds in West Virginia, U.S.A. Some runner bean seeds similarly affected were submitted to the Ministry's Plant Pathological Laboratory by an English seed firm in June last year.

In spite of all the attention that has been given to this problem up to the present, it has to be confessed that a clue as to the true cause of Marsh Spot has not yet been discovered, nor has any method of preventing its occurrence on certain types of soil been found. In the middle of May, 1935, the present writer visited some pea trial grounds in which Marsh Spot had become an increasingly serious matter in recent years. The locality was not near the sea, nor was the land in any sense of a marshy type; it was on a slope, and there seemed no obvious reason why drainage should not be quite good. On the opposite side of a path, not many feet wide, running alongside the rows of peas, there were plots of oats that were not thriving well. A cursory glance at them suggested that they might be suffering from *Helminthosporium* attack, but this was not confirmed by microscopical examination. Moreover, the seed sown had been treated with an organic mercury disinfectant. In reality the oats were found to be suffering rather severely from the non-parasitic disease known as Grey Leaf, caused, as it is now known, by a deficiency or non-availability of manganese. It was but natural to wonder whether, if this was causing trouble in the oats, it might not also lead to the development of Marsh Spot in the peas on the other side of the path.

It was then too late in the season to set out proper experimental plots to explore this idea thoroughly, but it did seem worth while to try treating parts of some of the rows opposite the oats with a solution of sulphate of manganese, leaving the

MARSH SPOT IN PEA SEEDS

other parts untreated, to see whether this would have any effect on the percentages of Marsh Spot in the harvested seed.

Since boron deficiency is also now known to cause disease involving tissue necrosis in certain crops (e.g., Heart and Crown Rot of sugar beet and Brown Heart of swedes and turnips), it was also thought worth while to apply a solution of borax to certain other rows with the same end in view. It may be stated at once, however, that the results with borax were variable and conflicting, and they will therefore not be discussed here.

For the manganese trials two groups of pea rows (A and B), each 40 yards long, one near the top of the slope and the other about one hundred yards lower down, were selected. The varieties concerned were Prestige, Gradus and Quite Content. To one half of each row sulphate of manganese was applied, the other being left untreated for purposes of comparison. The solution contained $1\frac{1}{2}$ oz. of manganese sulphate dissolved in 20 gal. of water, and this quantity per half row was applied twice, with an interval of a week, during mid-June.

It may be stated that the season of 1935 was an extraordinarily bad one for pea crops here. Wet weather in the spring, followed by some very severe frosts in the second half of May and by almost November-like conditions in June, more or less ruined the crops. The experimental rows when examined on July 16 showed no differences between the treated and untreated halves. They were harvested in due course, and from each half row (with three exceptions, in which only 47, 43 and 32 seeds were obtained) a fair number of reasonably good seeds were obtained, the average being 248. One hundred seeds, therefore, (with the three exceptions) from each half row were examined for the presence or absence of Marsh Spot. The results are presented in the following table:—

PERCENTAGES OF MARSH SPOT IN ROWS UNTREATED AND TREATED WITH SULPHATE OF MANGANESE.						
GROUP A.				Untreated.	Treated.	Reduction.
Prestige	..	..	..	65	53	12
Prestige	..	..	..	44	38	6
Gradus	..	..	..	81	14	67
Gradus	..	..	..	49	19	30
Quite Content	..	..	..	39	12	27
Quite Content	..	..	..	49	34	15
GROUP B.						
Prestige	..	..	..	80	41	39
Prestige	..	..	..	91 (32 seeds)	53 (47 seeds)	38
Gradus	..	..	..	77	34	43
Gradus	..	..	..	63	21	42
Quite Content	..	..	..	59	30 (43 seeds)	29
Quite Content	..	..	..	47	32	15

MARSH SPOT IN PEA SEEDS

It will be observed that although the application of sulphate of manganese by no means prevented Marsh Spot from appearing, even to a considerable extent in many instances, yet the percentage of affected seeds from the plots treated with this salt was in every single instance less, in most cases quite substantially less, than that from the untreated plots. The chances that such a result is purely accidental are small, and it seems justifiable to conclude, provisionally at any rate, that manganese deficiency may have some connexion with Marsh Spot.

It is interesting to note that the results of a couple of trials carried out in Holland last season point to the same conclusion. Thus, in a report by Mr. Ovinge, not prepared for publication but to which I am permitted to refer here, it is stated that in two trials, percentages of Marsh Spot of 42 and 11 in untreated plots were reduced by the application of sulphate of manganese when the peas were in flower, to 18 and 0 respectively.

It should perhaps be emphasized that the figures given in the above table are based on one season's results only, and they cannot therefore be regarded as furnishing conclusive proof that Marsh Spot results from manganese deficiency. Nevertheless, they do at least seem to indicate a line worth following up, and it is hoped that those who are interested in the problem and have the necessary facilities may pursue the matter further. It seems possible that with larger quantities of the salt, or with applications made at some more advantageous periods in the growth of the crop, more striking results might be obtained, and these are suggested as matters for further experiment.

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MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailer's contributions for February, 1936, are given below, with comparative figures for January, 1936, and February, 1935. In each month, the wholesale liquid milk price was 1s. 5d. per gal.

Region	Pool Prices (d. per gal.)			Producer-Retailers' Contributions (d. per gal.)		
	Feb. 1936	Jan. 1936	Feb. 1935	Feb. 1936	Jan. 1936	Feb. 1935
Northern	13½	13½	14	3½ ⁵ / ₁₆	3½ ⁵ / ₁₆	2½ ⁵ / ₁₆
North-Western ..	13½	13½	14	3½ ⁵ / ₁₆	3½ ⁵ / ₁₆	2½ ⁵ / ₁₆
Eastern	13½	13½	14½	3½	2½ ⁵ / ₁₆	2½ ⁷ / ₁₆
East Midland ..	13½	13½	14½	3½	3½	2½ ⁷ / ₁₆
West Midland ..	13½	13½	13½	3½ ⁵ / ₁₆	3½ ⁵ / ₁₆	3
North Wales ..	13½	13½	13½	3½ ⁵ / ₁₆	3½ ⁵ / ₁₆	3
South Wales ..	13½	13½	14	3½ ⁵ / ₁₆	3½	2½ ⁵ / ₁₆
Southern	13½	13½	14½	2½ ⁵ / ₁₆	2½ ⁵ / ₁₆	2½
Mid-Western ..	13½	13½	13½	3½ ⁵ / ₁₆	3½ ⁵ / ₁₆	3
Far Western ..	13	13	13½	3½	3½	2½ ⁵ / ₁₆
South Eastern ..	14	14	14½	2½	2½	2½
Unweighted Average	13·39	13·43	13·98	3·21	3·18	2·64

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producer's premium of 1d. per gal.

The inter-regional compensation levy was fixed at 2d. per gal. on liquid milk sales, compared with 1½d. per gal. in February, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Feb., 1936 (estimated) Gal.	Feb., 1935 Gal.
Liquid	44,712,256	42,936,640
Manufacturing	20,511,219	18,503,405
	<hr/> 65,223,475	<hr/> 61,440,045
Percentage Liquid Sales ..	68·6	69·9
„ Manufacturing Sales ..	31·4	30·1

The average realization price of manufacturing milk during February was 5·94d. per gal. compared with 6·27d. per gal. for February, 1935. Farmhouse cheesemakers manufactured 369,803 gal. into cheese, compared with 355,384 gal. in January, and 212,791 gal. in February, 1935.

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Hops Marketing Scheme. The Hops Marketing Board have made an additional payment to growers of 0.9 per cent. of the net value of the 1934 Quota hops, bringing the average growers' price for Quota hops up to £8 9s. 3d. per cwt. A further payment, completing 99 per cent. of the net value of the Quota pool, has also been made in respect of 1935 Quota hops. A sum of 5s. per cwt. is to be deducted from payments to producers of the 1935 crop, in respect of the expenses of the Board and to provide reserves.

Pigs and Bacon Marketing Schemes. *Pig Prices for March, 1936.* The contract price of the basic pig (Class I, Grade C) in March, 1936 was 11s. 5d. per score, compared with 10s. 8d. for February. This increase was due to the rise in the ascertained bacon price from 84s. 3d. to 90s. 3d. per cwt., and to an improvement in the realization value of offals from 9s. 5d. to 10s. 4d. per pig. In addition to the contract price, bonuses are payable to producers, out of a fund contributed by the curers, at the rate of 2d. per score for all pigs delivered under contract, to encourage increased deliveries during the first four months of the year.

Bacon-Pig Supplies for 1936. Following the arrangements made to enable curers who were short of pigs under direct contracts in January and February to make up their supplies in those months, agreement has now been reached regarding the regulation of supplies for March and April and, provisionally, for the remainder of the year.

For the months of March and April provision has been made in the home quota for the bacon equivalent of 30,000 pigs, which will be purchased by curers in the open market, and, accordingly, the foreign bacon quota will continue to the end of April at the rate in operation since the beginning of October last. A final decision regarding the home and foreign quotas for the period from the beginning of May onwards will be reached after a review of the situation early in April.

The difficulties that have arisen in the operation of the Pigs and Bacon Marketing Schemes have been the subject of much discussion recently, and the two Boards have agreed to set up a Joint Committee under an independent Chairman to consider the steps to be taken to remove the causes of those difficulties.

Election of Board Members. The annual elections of four

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district members of the Pigs Marketing Board were held on February 29, 1936, and resulted in the return of the sitting members for the South-Eastern and Eastern districts, Messrs. R. Rowland and W. Wilson respectively, and the election of Mr. S. H. R. Eva to represent the South-Western district. The retiring member for the East Midland district, Mr. J. M. Eady, was returned unopposed.

The annual elections of representative members of the Bacon Marketing Board resulted in the return of all the retiring members.

Bacon Development Scheme—Appointment of Sub-Committees. The Bacon Development Board have appointed a sub-committee to consider and report to the Board on licensing policy. The Board have also decided to set up an Advisory Committee on bacon of Dominion origin.

Consumers' Committees: Appointment of Chairman. Mr. Geoffrey K. Peto, C.B.E., has been appointed Chairman of the Consumers' Committees for England and for Great Britain, in succession to Sir Geoffrey Corbett, C.B.E., C.I.E.

The Potato Supply Position. Supplies of home-produced maincrop potatoes in the current season are below average, and on the recommendation of the Market Supply Committee provision has been made in recent months under the Potato (Import Regulation) Order for increased imports from abroad to supplement home supplies. Since December, however, actual imports have been considerably less than the permitted quantities, owing to the fact that short crops on the Continent have caused prices to reach a level at which importation into the United Kingdom has become comparatively unremunerative. On these grounds, the Potato Importers' Association has applied to the Import Duties Advisory Committee for the temporary remission of the import duty of £1 a ton on potatoes imported from foreign countries and the Irish Free State, and on the Committee's recommendation the application has been granted. The remission of the duty is intended to facilitate the importation of the quantities of potatoes estimated to be necessary to compensate for the deficiency in home supplies. The situation will be kept under close review.

Bacon Imports Administration. A note in the issue of this JOURNAL for February, 1935 (pp. 1089 and 1090), outlined the main provisions of the Form of Arrangement

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embodying the rules which the foreign countries scheduled to the Bacon (Import Regulation) Orders, 1934, and 1935, must observe as a condition on which certificates issued by them are permitted to have effect as bacon import licences. In order to secure a larger measure of control it has been found desirable to modify the terms of the Arrangement in certain particulars. Under the new Arrangement, which came into operation on March 1, 1936, the provisions relating to fortnightly sub-allocations for the main exporting countries, adherence to these sub-allocations within a tolerance of $2\frac{1}{2}$ per cent., and the offsetting of excesses within the next two fortnightly periods, are repeated, but the provisions relating to returns of actual exports and re-exports, the manner of effecting allowances for re-exports, and the making good of deficiencies, are strengthened.

All the scheduled exporting countries are required to supply prompt weekly returns of actual shipments and to discontinue the practice of making shipments in respect of anticipated re-exports. A return of bacon re-exports from the United Kingdom will in future be supplied to the Governments of the countries concerned twice a month, instead of monthly, and one-half of the quantities shown in the return will be added to each of the next two sub-allocations. Unless otherwise agreed, no country will be entitled to make good any deficiency after the lapse of two fortnightly periods. The countries supplying less than 1 per cent. per annum of the total imports from foreign countries are required to agree with the Board of Trade upon a programme of fortnightly shipments, as regular as circumstances will allow, instead of a programme of four-weekly shipments as heretofore.

Lard Supplies and Prices. In the issue of the JOURNAL for July, 1935 (p. 380), reference was made to the decline in imports of lard from the United States, the main source of United Kingdom supplies, due partly to the slaughter of pigs under the "Recovery Programme" and partly to the 1934 drought which ruined the American maize crop. The position showed no change in subsequent months and imports of lard into the United Kingdom in the year 1935 amounted to 1,531,000 cwt. compared with 2,809,000 cwt. in 1934, a reduction of about 45 per cent. Imports from the United States fell by 77 per cent. from 2,601,800 cwt. to 584,700 cwt., and imports from other countries rose from 207,200 cwt. to 946,400 cwt. The reduction of 2,017,100 cwt. in imports from

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the United States was thus offset to the extent of only 739,200 cwt. by other supplies. In May, 1934, the average price of American lard, as quoted on the London Provision Exchange, had fallen to 25s. 6d. per cwt., the lowest price for some years, but as a result of the reduction in supplies the average price advanced almost continuously from that time until, in August, 1935, it reached 79s. 3d. per cwt. By December last, the price had declined to 69s. 6d. per cwt. and a further fall to 62s. 6d. per cwt. occurred in January of this year.

Milk Act, 1934. *Manufacturing Milk.* Advances made by the Ministry up to March 15 in respect of manufacturing milk are as follows:—

Section		Period of Manufacture	Gallons	Amount
	<i>(1) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934– December, 1935	312,617,284	1,689,425
2	Manufactured by the Board	April, 1934– September, 1935	2,573,662	12,850
3	Made into cheese on farms	April, 1934– September, 1935	25,673,241	140,512
	Total for England and Wales		340,864,187	1,842,787
	<i>(2) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries	April, 1934– December, 1935	39,334,968	285,168

Milk-in-Schools Scheme. Exchequer contributions up to March 15 towards the expenses of the Milk Marketing Board for England and Wales in carrying out approved arrangements for increasing the demand for milk amount to £500,143.

Of this amount £491,268 was paid in respect of the supply of 26,722,646 gal. of milk to schoolchildren at reduced rates during the 14 months October, 1934, to November, 1935, the balance being in respect of general publicity.

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Cheese-Milk Price. For the purpose of Exchequer advances under the first three sections of the Milk Act, in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 4·5 pence per lb. for the month of March, 1936.

Extension of Milk Act, 1934. The Milk (Extension of Temporary Provisions) Act, which extends the main provisions of the Milk Act, 1934, until September 30, 1937, received the Royal Assent on March 19, 1936.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted by March 15 to £5,713,263. These payments were in respect of 2,399,742 animals, the average payment per beast being £2 7s. 7d. Some 716,000 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Wheat Act, 1932. *Sales of Home-Grown Wheat, Cereal Year, 1935-36.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to February 28, 1936, cover sales of 23,819,213 cwt. of millable wheat as compared with 24,417,810 cwt. in the corresponding period (to March 1, 1935) in the last cereal year.

Sales of British Wheat in the first 27 weeks of the Cereal Year, 1935-36. The Wheat Commission state that according to calculations based on wheat certificates received from registered growers, the total quantity of British wheat (including seed corn) marketed in the first 27 weeks of the current cereal year was approximately 24,000,000 cwt. (68·5 per cent.) in relation to the estimated United Kingdom wheat crop of 35,034,000 cwt. This compares with 64·7 per cent. and 60·1 per cent. in the same period in 1934 and 1933 respectively.

Second Advance Payment to Registered Growers for 1935-36. The Wheat Commission made an advance payment to 44,218 registered growers on February 22, at the rate of 2s. 9d. per cwt. (12s. 4½d. per quarter) in respect of 9,039,700 cwt. (2,008,800 quarters) of wheat vouched for by 61,825 wheat certificates delivered to the Commission between November 2, 1935, and January 24, 1936. The total amount

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involved was approximately £1,243,000. Any balance due on these certificates will be paid in September, 1936.

The Commission hope to make two further advances during the cereal year at dates to be announced.

New Quota Payments Order. The Minister, in pursuance of the powers conferred upon him by the Wheat Act, 1932, and on the recommendation of the Wheat Commission, made, on February 19, the Wheat (Quota Payments) No. 1 Order, 1936 (Statutory Rules and Orders, 1936, No. 116) prescribing that the amount of the quota payment that every miller and every importer of flour should be liable to make to the Wheat Commission in respect of each hundredweight of his output, should, as from February 23, be reduced to 14·4 pence, i.e., 3s. per sack of 280 lb. This Order supersedes the Wheat (Quota Payments) No. 3 Order, 1935, under which the quota payment had been 16·8 pence per cwt., i.e., 3s. 6d. per sack of 280 lb., since November 3, 1935.

Sugar-Beet. Contracts for 1936-37 Campaign. The Beet-Sugar Factories Committee have agreed with the National Farmers' Union the form of contract for the coming campaign, and have issued it to growers on behalf of the proposed British Sugar Corporation, Ltd. The new form of contract provides that beet shall not be grown on land cropped with beet last season.

National Mark Schemes for Cheese. Meetings of the newly-formed cheese grading committees set up in connexion with the impending National Mark Schemes for Lancashire, Leicestershire and White Wensleydale cheese were held during March. The Committees considered various matters relevant to the administration of the schemes, including the conditions of authorization of cheese makers, the appointment of approved graders and the grading fees to be charged for graders' services. Regulations prescribing grade designations and definitions of quality have been published in draft form in respect of these types of cheese, and it is hoped that schemes for Lancashire and Leicestershire cheese will come into operation in April. In the following month, White Wensleydale labelled with the National Mark should also be on the market.

The National Mark schemes for Cheshire, Cheddar, Stilton and Caerphilly cheese continue to progress. The newly-formed Association of National Mark Cheshire Cheese

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Manufacturers having now appointed their own grader to undertake the grading of creamery-made cheese, the operations of the official grader of the Cheshire Cheese Federation are now confined to the output of farm cheese makers.

The system of grading by an independent grader, recently introduced for Caerphilly cheese, is working satisfactorily; reports from Highbridge Market indicate that the graded cheese commands a satisfactory price at the auctions as compared with that for the ungraded product.

National Mark Publicity. National Mark "Weeks" were held at Hereford, Worcester and Gloucester during February and March. The centre of operations in each city was a National Mark exhibition that attracted many thousands of visitors. The exhibition included displays of National Mark produce, cookery and egg grading demonstrations, a poster ballot competition and film displays. Samples of National Mark products were on sale and copies of the new National Mark Calendar of Cooking (see below) were distributed. Other activities included shop-window display competitions for retailers, cookery competitions and film displays for housewives and senior school children.

A National Mark "Week" is to be held in York during the period May 8-16.

The Ministry has recently published a National Mark Calendar of Cooking to replace the National Mark Recipe Book, which had a circulation of 400,000 copies during the period October, 1934, to December, 1935. This Calendar of 128 pages has quickly secured public favour; the first edition of 100,000 copies was exhausted in three months, and a second edition of 200,000 copies is now being printed. It is illustrated by wood cuts depicting the seasons and contains 150 recipes suitable for each month of the year. The Calendar was compiled for the Ministry by two well-known experts—Mr. Ambrose Heath, author of numerous books on the art of cooking, and Mrs. D. D. Cottington Taylor, Director of the Good House-keeping Institute. Copies may be obtained free on application to Department J, Ministry of Agriculture, 10, Whitehall Place, London, S.W.1.

British Industries Fair. It is now possible to form some estimate of the success of the exhibit staged at the British Industries Fair (see February JOURNAL, p. 1145) and of its value to the National Mark movement. Sales of samples of National Mark products reached the record figure of 10,000,

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representing an increase of 30 per cent. on last year's sales. National Mark cheese proved very popular, upwards of 7,000 samples of Cheddar, Cheshire and Stilton being sold. Other products for which samples were in keen demand were National Mark canned fruits, vegetables and jam. National Mark Cheddar cheese made its début at the Fair and numerous inquiries were received regarding National Mark Stilton, arising from the general shortage of blue-veined cheese.

A display of glass-ended cans of fruit and vegetables attracted considerable attention.

Australia : Regulation of Meat Exports. The Meat Export Control Act, 1935, which came into operation on January 2, 1936, sets up an Australian Meat Board for the regulation of exports. The Board of eighteen members includes representatives of producers, meat export companies and publicly owned abattoirs. There will also be one representative of the Government. There is to be an Executive Committee and a Beef Committee of the Board, and a London representative is to be appointed.

The Board are to make recommendations to the Minister of Agriculture as to regulations for the export of meat, meat products and edible offal, and to advise the Minister on questions of grading and on matters of policy. The Board may undertake research and the promotion of sales overseas. Returns may be required from persons engaged in the industry and the Board are to make a report annually for submission to Parliament. In order that control may be effective, regulations may be made to prohibit the export of meat, meat products or edible offal except under licence issued by the Minister. After a date to be prescribed, all contracts for shipment or insurance of the regulated products for export after March 1, 1936, must be made through the Board's agency, or under its approved conditions.

The cost of administration is to be met out of the proceeds of levies to be imposed on exported meat at the rate of 1*d.* per carcass for mutton, lamb or pork, $\frac{1}{2}$ *d.* per carcass for veal and $\frac{1}{4}$ *d.* per quarter for beef, and at roughly corresponding rates for bacon and canned meat. Exemptions from this levy may be granted from time to time by Order of the Governor-General.

Australia : Breeding Stock from the United Kingdom. The Commonwealth Government have made arrangements, for a tentative period of two years from December 1, 1935, to accord financial assistance to importers of pedigree cattle, sheep, milch goats and pigs from the United Kingdom. The scheme applies only to animals registered by a recognized stud society. The shipping companies have agreed to specially reduced freight rates based on out-of-pocket expenses only. The expenses due to the transport of the stock from United Kingdom port to Australian port (including freight, quarantine, insurance, feed, etc.) will be borne as to two-fifths by the importer, and as to one-fifth each by the Commonwealth Government and the State Government concerned, the remaining fifth being borne provisionally by the Commonwealth Bank. The assistance is confined to expenses incurred in transport, no assistance being given in respect of the actual cost of the animals. An essential condition for assistance is that the stock shall be retained by the importer for his own use for at least two years.

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Danish-German Trade Agreement. A new trade agreement between Denmark and Germany was signed on January 30, 1936, and came into force, pending ratification, on February 1.

The introduction by Germany in 1933 of new regulations affecting the marketing of agricultural produce made necessary negotiations between the two countries, leading to the first agreement, signed on March 1, 1934. The main portion of the agreement related to the actual exchange of goods. Provision was made for the import by Germany of 50,000 head of Danish cattle (compared with a normal import of 250,000, though in 1933, owing to the German restrictions, imports reached only 18,000 head). The price was fixed, and a mixed Danish-German cattle committee was appointed to arrange details of shipments. Germany also undertook not to increase, so far as Danish products were concerned, the import duties on cattle for slaughter, cheese and certain kinds of fish. Imports of Danish butter in 1934 were guaranteed to reach at least the same volume in 1934 as in 1933, but a reduction was agreed on with regard to eggs, cheese, lard and meat offal. Denmark, on the other hand, undertook to maintain the same ratio between imports from and exports to Germany as hitherto, i.e., about two to one.

By an agreement of January 24, 1935, the first agreement was renewed, with provision for increased imports into Germany during 1935 of Danish cattle, butter and eggs. For a number of other Danish products, the quotas remained unchanged. In addition to the cattle committee, another mixed committee was set up to control the supply of pork, poultry, lard, butter, fruit and eggs to the German market, with power to fix maximum and minimum prices; provision was also made for the appointment of other committees to deal with single commodities. In the latter part of 1935, exchanges of commodities were arranged in excess of the quotas.

The new agreement for 1936 is in two parts, one dealing with specific quantities of certain goods the sale of which is guaranteed, and the other with quantities, for which no guarantee is given, but a market for which is considered certain. The second part of the agreement may be prolonged to 1937 and 1938. The agreement provides for increased quotas of Danish produce in 1936, an increase of 50 per cent. in the number of cattle admitted being guaranteed. Imports of Danish butter, eggs, cheese and fats will be larger, and of pigs very much larger, than in 1935. Actual quantities, however, are not officially revealed. On the other hand, Denmark has undertaken to facilitate the import of German manufactured products to a corresponding extent, and although the Danish negotiators were unable to give a guarantee to accept German goods to a given value, they were able to promise that foreign exchange certificates would be made available to an amount corresponding to the increase in imports from Germany. The payments involved in the exchange of commodities are to be made through the Danish National Bank and the Reichsbank.

Germany: Trend of Livestock and Meat Market.* Recent variations of purchasing power in Germany have had a much greater effect on the prices of livestock and meat than on other classes of agricultural products. This is due partly to the greater elasticity of meat consumption as compared with such foods as bread and potatoes and partly to the fact that, requirements of meat being almost entirely satisfied from home supplies, it was not possible to stem the fall in price by import restrictions as was done with wheat, butter and eggs. As a result, livestock prices fell heavily in 1932; and in January, 1933, the prices of slaughter livestock

* Note by the Market Supply Committee.

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were less than 60 per cent. of the 1913 prices as compared with 88 per cent. for livestock products and 96 per cent. for vegetable foods. During the second half of 1934, there was a strong recovery in livestock prices owing to the intervention of the Government in withdrawing pigs for the manufacture of neutral lard, and subsequently purchasing cattle, pigs and calves for the manufacture of canned meats. In 1935, with smaller offerings and increased demand, livestock prices quickly advanced. The considerable price changes that have occurred during the past three years are as follows :—

GERMANY : LIVESTOCK PRICES (A = BEST QUALITY ; B = LOWEST QUALITY). (R.M. PER CWT.)

Period	Oxen		Cows		Calves		Fat Lambs	Pigs 120-150 Kg.
	A	B	A	B	A	B		
1933	31·5	24·0	26·3	13·3	41·0	29·8	35·8	42·0
1934	33·7	26·5	29·5	14·5	47·0	33·7	42·5	46·6
1935	41·9	38·9	41·7	27·2	71·3	55·6	57·5	53·8
Per cent. increase Dec. 1935 Compared with 1933	33	62	59	105	74	87	61	28

It is noteworthy that, in consequence of the system of maximum prices, lowest quality livestock, especially oxen and cows, increased in price considerably more than best quality.

Meat prices fell much less than livestock prices during the crisis years. With the help of drastic administrative measures, increases in meat prices in subsequent years have been kept within bounds, so that as compared with a rise of 60 per cent. in livestock prices, there has been an increase of only 17 per cent. in meat prices. The following Table shows meat price indices based on the boom period of 1928-30 :—

GERMANY : MEAT PRICE INDICES. (1928-30 = 100).

	Beef	Pork	Veal	Mutton	"Game" Sausage	Bacon	Lard
1931	81·7	70·8	82·3	86·4	81·5	76·5	75·4
1933	61·6	63·3	61·0	63·3	67·3	59·1	71·0
1934	62·7	68·1	62·5	68·0	68·4	59·7	80·8
Dec. 1935	70·1	72·1	81·8	84·0	75·8	71·0	84·6
Per cent. increase Dec. 1935 Compared with 1933	14	14	34	33	13	20	19

As the curve of meat prices since 1934 has been continually below the curve of livestock prices, the butchers' margin has considerably narrowed compared with the 1928-30 boom period.

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Norway : Distribution of milk at reduced prices to schoolchildren and necessitous persons.* In the past financial year, a sum of 200,000 Kroner (about £10,000) was appropriated in the Norwegian budget for the promotion of milk consumption by necessitous persons. This fund was administered by the "milk centrals," which, in almost every instance, supplemented their allocation out of their own funds and arranged for a reduction in price of from 2 to 4 øre per litre of milk ($\frac{1}{4}$ d. to $\frac{3}{4}$ d. per quart). This year the measure has been extended ; the sum of 1,000,000 Kroner (about £50,000) has been voted, of which 200,000 Kroner has been appropriated for the distribution of free milk to schoolchildren, and the balance for increasing the consumption of milk by necessitous persons by means of price reductions. No contribution is forthcoming this year from the "milk centrals." The provisions for cheap milk for necessitous persons will enable price reductions to be made varying between 5 øre—25 øre per litre (about $\frac{1}{4}$ d. to $3\frac{1}{4}$ d. per quart) according to the means of the recipient and the retail price of milk in the locality. Thus, when the retail price does not exceed 25 øre per litre (the present average retail price for Norway is 26 øre per litre) it will be possible to grant free milk, but the highest rates of reduction may be adopted only in specially difficult cases. In special instances, the scheme may be applied to skimmed milk for human consumption, when a reduction of 5 øre per litre may be granted. This will enable skimmed milk to be obtained free in most places.

Note by the Market Supply Committee.

APRIL ON THE FARM

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Sheep. The date when Easter falls is a matter of importance to producers of early lambs. With Good Friday on April 10, there should be a fair number of lambs from the grass districts; in arable sheep farming in the southern counties, early lambs are a normal product. Fortunately, the time has not yet arrived when the number of lambs at this time of the year is sufficient to bring down prices to the ordinary level. The high value of lamb per lb. up to Easter can be gauged by the fact that dead weight quotations up to this date are made on the basis of carcasses dressed with "all on," i.e., weighed with skin, gut-fat, head, heart, lungs and feet.

Two Easter lambs were followed to a neighbouring slaughter house in order to get information on the proportion of carcass yielded by such young lambs, and on the comparison of an "all on" quotation with that for the "bare" carcass.

Comparing one of these Easter lambs with a more mature animal slaughtered later in the season, the results were:—

	<i>Easter</i> <i>lb.</i>	<i>Later</i> <i>lb.</i>
Live weight off the field	45½	71
Dead weight with all on (warm)	40	—
Dead weight (cold, 24 hours later) dressed normally		
but feet left on	28	38½
Loss due to drying	3½	1
Skin	4½	7½
Head and pluck	4	4½

Thus, in the Easter lamb, the 12 lb. difference between the "all on" weight and the bare carcass dressed in the usual way is made up of 3½ lb. loss in drying and 8½ lb. weight of skin, etc., removed; this loss in drying is above the average, and amounted to only 2 lb. in the other early lamb. It was calculated from the above that a quotation of 1s. 4d. per lb., with all on, was equivalent to 1s. 11d. per lb. for a carcass dressed in the post-Easter fashion. As regards the proportion of carcass, the early lamb yielded 61 per cent. "bare" carcass, as compared with 53 per cent. for the late animal.

The stomach and intestines of a lamb nourished mostly on milk are probably smaller in proportion than those of a lamb eating much grass.

Lambing in the mountain flock takes place this month. Prospects are described as "not so bad." Twin lambs are neither expected nor desired, and prospects mainly refer to the condition of the ewes and the proportion of barren ewes.

There have been more complaints than usual this year of damage by foxes. On each farm, only one of twin lambs was taken, but this occurred for several nights; there was very little trace of the raider, and, had the lambs not been counted, the loss would not have been discovered. In one instance, the circumstance that astonished the farmer most was that the ewes did not appear to be agitated in the morning; he was confident that one ewe, which had been brought up as a pet lamb, would have put up a good fight for her lamb, but she did not appear at all ruffled next morning.

Cattle. The liberation of cattle from winter quarters is the most important event in their calendar. In this area, unlike the south of England, only a small proportion will be turned out to pasture before the middle of May. Grass sheep are excellent for converting pastures into cash, but their disadvantage becomes keenly felt at this period of the year, when the time for turning out the cattle has to be delayed because all the grass has been cleared off.

Complaints by milk customers about milk appearing "blue" cease as soon as the cows get to grass—and this is no small relief to the retailer. Recently a retired dairyman, who used to have a round in an English industrial town, referred to the "good old days" when it was not illegal to colour milk. He recalled the flood of complaints that would come if, by accident, he ran short of anatto, and he spoke with the air of a public benefactor of how peace and content were at once restored with the arrival of the colouring substance. The natural colour of milk is, contrary to the opinion of most consumers, in no way dependent on fat content; it is, however, bound up with the content of vitamin A, and the user is not wholly wrong in his preference for milk of rich colour. This is an interesting example of the fact that the opinion of the "man in the street" may be thought wrong by the scientist, but is often found ultimately to be approximately correct; another example was when the public

insisted that butter was superior to margarine in the pre-vitamin days.

The carotene in grass is responsible for the rich colour of the milk of cows on pasture; grass and other green foods are rich in this material. Most of the carotene is preserved in silage and in the artificial drying of grass, but is lost in hay-making. A milk producer who was unable to get in his kale during the recent snow, remarked that the rich colour was not restored to the milk until a week after recommencing to feed the kale; with cows going out to grass, the richness is acquired in half this time.

On the Land. April, together with the previous month, covers the peak period of activity on the land. In this district, the potatoes and cereals are mostly in by about the end of the third week, and the mangold crop is then next on the list. The young corn, particularly when viewed with the sun at one's back, gives an early indication whether the sowing has been too thick or too thin. It does not seem to be generally realized that, in order to get the full financial benefit from the treatment of oats or barley with a fungicide, one must guard against sowing too thickly. Treatment of the seed with suitable materials amounts to a cheap form of insurance against factors likely to cause the death or weakening of some of the plants, and reduces the need for a heavy seeding given in order to "be on the safe side." Seed-borne diseases, like Leaf Spot in oats and Leaf Stripe in barley, are more destructive if the weather conditions cause the crop to halt in its early growth. Dr. Alun Roberts (*Jour. Agric. Sci.*, 1928) showed that the 20 days following the emergence of the plants is a critical period, warm, dry weather being essential; it is possible that cold, wet weather at this critical period might favour this disease. This may explain why, in some seasons, seed treatment results in greater yield increments than in others.

The spring cultivation of wheat was the subject of an interesting paper read by Dr. Sanders before the Farmers' Club (November, 1935), and it raised a good discussion. The roll and harrow are generally used, except in a wet spring; the former counteracts any puffiness that may have developed in the winter, and presses the soil to the roots of the crop. In the Cambridge trials referred to in the paper, the consolidation as a result of rolling was very superficial, extending

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only to a depth of 2 in. However, rolling levels the land for the binder, and, like harrowing, if done at the right time, breaks up the hard skin of soil that forms on the surface after the winter rains. It was concluded from the Cambridge trials that, on heavy land, the spring cultivation of wheat was a waste of time, and that rolling when the field is loose does not increase yield, though there was an indication that breaking the "cap" in spring may be beneficial. No definite increase in yield was obtained on light land. In the discussion, Mr. A. Amos emphasized the importance of spring harrowing for weed destruction; he recalled that, in parts of Norfolk, this operation is referred to as "red weed" (poppy) harrowing, because of the way in which it destroys poppy seedlings. Mr. Amos considered that even if harrowing had negligible results on the wheat its beneficial results would be seen in the next crop.

Swede seeds are mostly purchased early this month. There is a large choice of varieties. These do not differ much in yielding capacity, as with mangold varieties. In reviewing, a short while ago, the results of ten years' variety trials at this College, it was concluded that there was no difference between the yielding capacity of the different sorts. Factors, other than variety, play such important rôles in determining yield that they probably obscure the effects of variety. With such a small seed, sown at a time of the year when the soil is apt to be dry, factors such as soil moisture content and depth of sowing are all-important. Many of us can recall seeing an area of swedes with alternate good and poor rows—caused by one side of the drill accidentally sowing at just the correct depth, and the other too shallow, or too deep. Again, instances are not uncommon where the difference of a few hours in sowing has made all the difference between success and failure.

Where Club-root, or Finger-and-Toe, is rife, a Danish variety, Wilhelmsburger, can be recommended. Dr. Whitehead has shown (unpublished as yet) the superiority of this variety in this respect. It is now marketed in this country. Messrs. Gartons, while recommending it as a resister to this disease and to mildew, state that the roots do not grow to a large size. This does not agree with the results of some years of experimenting at Bangor, where Wilhelmsburger not only proved the most resistant variety to Club-root, but was equal to the best in yield. Bangholm is another

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Continental variety marketed in this country because of its resistance to the same disease.

For Young Farmers. Sheep that were sent from the uplands last October to winter on low ground at other farms are returned this month. People who see large stretches of mountain land carrying very few stock in summer frequently do not realize that the sheep-carrying capacity of a mountain grazing is often limited by the number that can be economically kept in winter. This is particularly likely to happen now that two- and three-year-old wethers are no longer kept owing to lack of demand for this class of mutton. They could be left up in winter as well as summer, but in-lamb ewes require better keep. If many of them, as well as the ewe lambs, have to be sent away for winter the cost makes too great an inroad into the total annual receipts. This is one of the many factors that account for the existence of deer forests in the Highlands of Scotland. In Wales, it is estimated (Mr. E. Davies in *Geography*, June, 1935) that the capacity of many such farms is about twice as great in summer as in winter. In the Highlands of Scotland, except where the mountain masses merge into the lowland, the difference between summer and winter capacity is greater still owing to the comparatively large amount of moorland, and, in many instances, as in much of the deer forests, the land can carry no sheep in winter.

The arrangement by which a portion of the flock from upland farms is sent for wintering, at an agreed price, to other farms, enables mountain land to be stocked to the full in summer. The sheep wintered out in this way, "tack sheep," are sent away in October; if only a portion of the flock goes, it is generally the ewe lambs, the most important part of the flock. These young sheep are thus given an opportunity of making better growth, and are less likely to encounter rams, because most farmers taking in such sheep have no flock of their own.

In the past winter, the price paid for the wintering of Welsh Mountain ewe lambs has been from about 6s. 6d. to 8s. 6d., paid on the number returned alive; this system of paying encourages good shepherding. In a few districts, if a sheep dies, the pelt and ears have to be shown to the owner as a routine method of dispelling any doubts! Sheep are sometimes sent long distances of 200 miles or more, more

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particularly in Scotland, and special terms are obtained from the railway companies. The fertile valley pastures are not used for wintering such sheep because they are used for fat lamb production, and because the ewe lambs would, on such land, get too coarse in the bone. On farms where sheep are agisted, the fact that the farmer has no sheep of his own helps to keep the land healthy, and prevents the pastures being grazed too bare before they arrive; looking at it from the point of view of the occupier, his grass land has a month in which to grow between the times the sheep are sent off and the cattle are turned out.

In the Romney Marsh, young sheep go from the lower land to the uplands of Kent and Essex, thus reversing the movements referred to above. In this way, the ewe lambs get to drier land, and escape the ravages of intestinal parasites.

Geographers apply the term "Transhumance" to denote this custom of periodically moving animals between two regions. Abroad, it is practised more where mountains are contiguous with summer parched plains. In "nomadism," the whole tribe accompanies the animals, but in "transhumance," found in more settled agriculture, the care of the flock is, in most instances, handed over to the other man. Dr. Walton (*Geographical Teacher*, 1919) points out that the fact that this custom is practised by both primitive and highly civilized peoples is "standing proof that analogous geographic factors entail analogous social developments."

NOTES ON MANURING

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Organic Manures. To what extent can natural organic manures be replaced by artificial fertilizers? How long can we maintain a reasonable level of crop yields with artificials alone? If organic manures are necessary to the maintenance of fertility, why are they thus necessary, and wherein do artificials fail?

Such conundrums as these are easy to propound but are, in the existing state of knowledge, impossible to answer in any complete or precise manner; nor is it likely that complete answers will soon be forthcoming, for the questions lead us into some of the most difficult and obscure regions of soil science. Moreover, it is clear that no general answer will apply to all soils and all species of crops. Circumstances alter cases.

In connexion with a broad problem of this sort it is very useful, once in a while, to have a summary of the known facts. A recent publication of the Imperial Bureau of Soil Science is worth notice.* It covers the whole subject of organics—green manuring, compost making, the storage and treatment of farmyard manure and so forth—and is essentially practical in its treatment.

Let us look at some of the experimental evidence bearing on the questions that have been put. Most of this evidence comes from Rothamsted and Woburn, because these are the only stations where continuous manurial experiments have been going on for long enough to allow of final conclusions being drawn.

Mangolds at Rothamsted. The figures for the continuous mangold plots at Rothamsted tell us what has happened on one particular soil under one particular crop. There are thirty plots in the experiment, each having received its particular manurial treatment annually since 1876. The only reservation about the results is that the treatments are not replicated, so that certain of the yield differences are doubtless due, in part, to original variations in the soil from one plot to another. There are thirty plots in all, but six of them

* Technical Communication No. 33, "Organic Manures," by S. H. Jenkins, Ph.D., F.I.C. Published by the Imperial Bureau of Soil Science, Harpenden, Herts. Price 2s.

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tell the essence of the story. The yields given are the averages for the first thirty-six years of the experiment.

	<i>Yield</i> <i>Tons per acre</i>
No manure	3.7
3½ cwt. superphosphate	14.6
4 cwt. ammonium salts	
4½ cwt. sulphate of potash	
14 tons dung only	18.2
14 tons dung	24.4
12 cwt. artificials, as above	
2,000 lb. rape cake	22.3
12 cwt. artificials, as above	
14 tons dung	27.2
2,000 lb. rape cake	
12 cwt. artificials, as above	

Thus a heavy annual dressing of artificials, while producing a moderately satisfactory yield, failed to give as much benefit as dung alone; a dressing of either dung or rape cake, added to the dressing of artificials, produced quite a considerable increase in yield; while a further increase was secured when the two organics were used together, in conjunction with the artificial.

Barley at Woburn. Turning from the heavy soil of Rothamsted to the light sand of Woburn, and from mangolds to barley, we get a different tale. In this experiment, which was carried on for 30 years, an annual dressing of dung, calculated to supply 110 lb. of nitrogen per acre (i.e., about ten tons of dung if we assume a nitrogen content of 0.5 per cent.) was compared with a "complete" artificial dressing containing only 41 lb. of nitrogen per acre—about 2 cwt. of sulphate of ammonia or 2½ cwt. of nitrate of soda, as the case might be. The average yields, calculated for the six quinquennial periods, were as follows:—

			<i>Barley—Bushels per Acre</i>		
			<i>Sulphate of</i>	<i>Nitrate of</i>	
			<i>Ammonia and</i>	<i>Soda and</i>	
			<i>Minerals</i>	<i>Minerals</i>	
	<i>Dung</i>				
1877-81	34	..	37	..	38
1882-86	42	..	45	..	49
1887-91	34	..	38	..	41
1892-96	39	..	27	..	35
1897-1901	35	..	10	..	35
1902-06	38	..	4	..	33

Here it is obvious that some accidental factor has upset the results, for the main contrast is not between dung and

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artificial, but between one artificial and another. The explanation of the contrast is, of course, that the continued application of sulphate of ammonia exhausted the lime reserves of the soil and that the barley, which is an acid-sensitive plant, failed as the soil acidity rose. The condition of the land was in fact easily restored by means of a subsequent application of lime. If we compare the first and the third columns it will be seen that the yield on the dunged plot was maintained at a more or less constant level throughout the thirty years, whereas the artificial (nitrate of soda) gave better results than the dung for the first fifteen years, but somewhat less satisfactory results in the last fifteen. Even with this fall, however, the yield of barley was still, after 30 years, at a level above the British average figure.

The figures, even for thirty years, fail indeed to tell the whole story, for it is quite certain that at the end of the period the dunged plots must have had a large built-up reserve of fertility and would, if all manuring had ceased in 1906, have continued to yield reasonable crops for many years. The artificial plots, in the absence of their annual dose of nitrogen, would have fallen off very quickly in productive capacity. This clearly follows from another Woburn experiment in which two plots received respectively a double and a single dressing of dung annually for the five years 1877-1881 inclusive, while a third plot received no dung. After 1881 and until 1906 all three plots were under barley each year, without any manure whatever. Towards the end of the period (more than twenty years after the dung had ceased to be applied) the double-dressed plot was still producing a yield of the order of 6 sacks an acre; the single dressed plot had fallen to about 4 sacks; and the unmanured to about $1\frac{1}{2}$ sacks. Undoubtedly some part of this residual effect of dung is due to the gradual release of stored-up nitrogen; but it is likely that the physical effect of the humus is also important.

Four-course Rotation at Rothamsted. The four-course rotation experiment at Rothamsted is perhaps the most interesting evidence because the conditions are not far removed from actual practice. One series of plots constitutes a miniature "selling" farm where no stock is kept and where complete reliance is placed on artificials. Another series represents the case where a fair head of stock is maintained but no artificials are used. The third represents the more usually adopted scheme of keeping stock to make muck while

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using a moderate amount of artificial as a supplement to dung. The yields from the unmanured series are given for comparison. The figures are the average for twenty-four years:—

	Turnips (tons)	Barley (cwt.)	Hay (cwt.)	Oats (cwt.)
No manure	7.5	8.8	20.0	10.4
14 cwt. complete artificials to turnips; 7 cwt. artificials to hay; inorganic nitrogen to corn ..	18.5	21.2	33.4	19.2
10 ton dung to turnips (no artificial)	19.2	20.7	28.0	20.2
10 tons dung to turnips, 7 cwt. artificials to hay	20.0	22.3	42.1	20.5

Here the artificial manures alone have maintained yields that are well above the British averages and that are, on the whole, about as good as those obtained by the use of dung alone. It must, however, be noted that the quantities of artificials employed are large, working out to an average of nearly 6 cwt. per acre per year. Even if we put the value of dung at the fairly high figure of 10s. per ton the cost of maintaining the fertility of the soil would be somewhat less with dung alone than with artificials alone. Taking any reasonable series of values for dung, artificials and produce, the combination of dung and artificial must be easily the most economic.

On the whole then we may admit that a fair level of productivity may be kept up, for considerable periods, with artificials alone, and that certain crops, particularly wheat and barley, suffer relatively little from the prolonged neglect of organic manuring; nevertheless, we must also acknowledge that there is in farmyard manure some virtue that is lacking in the so-called "complete" artificials when applied in the usual manner.

Certain obvious explanations doubtless account in part for this special virtue. For instance, it is obvious that, on the Rothamsted mangold field, the dunged plots, with a given amount of tillage, work to a better tilth than the "artificial" plots. It is known, too, that the inorganic forms of nitrogen are so quickly available that the supply of nitrogen may be exhausted before the end of the plant's feeding season—a risk that may, however, be avoided by the practice of late top-dressing. Again, it is conceivable that a soil, in the total absence of organic manures, may run short of elements other than those contained in the ordinary "complete" fertilizer; possibly a truly complete artificial would give better results.

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Finally, there are growing indications that definite organic substances, now being called *auxins*, may exert influences on the growth and health of the plant comparable to those of vitamins in animal nutrition. This subject must, however, be left over for separate consideration.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Mar. 11.				
	Bristol	Hull	L'pool	London	Cost per Unit at London
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:—					
Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium Cyanamide (N. 20.6%)	7 4s	7 4s	7 4s	7 4s	7 0
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	4 18	4 15	4 13	4 15	3 2
" " (Pot. 20%) ..	3 15	3 12	3 10	3 12	3 7
Muriate of Potash (Pot. 50%)	7 18	7 16	7 12	7 16	3 1
Sulphate " " (Pot. 48%)	9 8	9 6	9 2	9 6	3 10
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	—	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%)	2 19	—	2 19f	2 16g	3 6
" (S.P.A. 13½%)	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½%, P.A. 20½%)	—	6 17	6 5h	6 0	—
Steamed Bone Flour (N. ½%, P.A. 27½—29½%) ..	5 12	5 10	5 2h	5 2	—

Abbreviations N. = Nitrogen; P.A. = Phosphoric Acid;

S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 8d. extra.

h Prices shown are f.o.r. Appley Bridge.

NOTES ON FEEDING

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Modern Nutrition Science. The twentieth century, with little more than one-third of its course run, has seen a remarkable advance in our knowledge of nutrition. At its opening the current teaching was content to regard the values of foods or rations as being adequately defined by their content of available energy (or gross digestible energy) and of digestible protein. On this basis two rations that were equal in energy supply and protein supply were to be regarded as of equal value, and the actual constituent foodstuffs from which they were compounded might consequently be regarded as of little or no significance, except in so far as they might influence factors such as palatability, or the character of products such as milk, body fat or butter fat manufactured by the animal from its food. Mineral requirements were regarded as so small that deficiency was hardly likely to arise in farm practice, except perhaps as regards the supply of calcium and phosphorus where rapid bone formation or high milk yields were in question. Practical experience that did not harmonize with these views was largely disregarded, not as being unimportant, but as either inexplicable or based upon faulty deductions.

At this period, therefore, the attention of nutrition investigators was largely directed to the study of energy relationships and the nature of the proteins, and in both fields remarkable advances were well under way before the close of last century.

In the matter of energy supply the first advance in the solution of many discrepancies between theory and practice came through the successful establishment of the conception that only a portion of the gross available energy of the food can be applied to productive purposes. The part that is required to provide for maintenance and the work of mastication and digestion must inevitably be liberated and dissipated as heat, so that only the balance can be available for productive purposes. It is the size of this balance (or the "net energy" of the food) that determines, therefore, the energy value of the food for purposes of production.

Here was provided at once the explanation why, for

NOTES ON FEEDING

example, quantities of hay and maize meal that contain equal amounts of available energy show such different productive effects, since the former, being a coarse, fibrous material, demands for its mastication and digestion more energy than the latter, and consequently leaves at the disposal of the animal a smaller surplus of "net energy" for production purposes. For the development of this conception in its application to the feeding of farm animals we are indebted above all to the work of Kellner in Germany and Armsby in America—work on which are based, as far as energy values are concerned, the modern methods of scientific control of rationing.

In the domain of protein research also, the way to a more precise understanding of the functions of proteins in nutrition had been opened up at the end of last century by the brilliant work of Emil Fischer and others, which had demonstrated that these hitherto mysterious and baffling nitrogenous substances were definite chemical entities of a very complex nature, built up from a variety of "structural units" belonging mostly to the classes of amides and amino-acids. Subsequent research has demonstrated that individual proteins differ widely with respect to the kinds and proportions of these "structural units" present in them, and that in the animal the proteins are assimilated in the form of these "units" into which they are resolved by the proteolytic enzymes of the digestive juices.

Equally important is the discovery that some of these amino-acids are absolutely essential to the animal and must therefore always be present in the products of digestion of the food proteins in the animal if successful results are to be achieved.

In other words, in considering food supplies, the *quality* of their proteins, as determined by their "make-up" of these amides, amino-acids, etc., must needs be taken into account as well as the *quantity* of proteins present. This is roughly safeguarded in practice by including in the ration a variety of feeding-stuffs, so that there may be a reasonable chance that what may be missing in the make-up of the protein of one ingredient will be made good by the others. This adds a scientific advantage to the many practical advantages of the complex over the simple ration.

Within the first decade of the present century came the momentous discovery of the vitamins, and in the second

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decade the revival of interest in the functions and practical significance of the mineral ingredients in the dietary.

Out of these two developments has arisen the study of deficiency diseases and less acute phenomena of malnutrition bearing closely upon the health and constitutional vigour of animals, which now so largely dominates the field of nutrition research.

Cutting across all these lines of study of individual factors is the newer work on the correlations between different factors and their interdependence on each other. A common example of this is found in the case of the interaction of the supplies of calcium and phosphorus, or, more broadly, of the basic and acidic ingredients in the diet. "Balance" in the proportions of individual factors present, is now being revealed as a consideration that must be taken into account alongside the actual amounts of each factor supplied in drawing up the ideal dietary.

In recent years the intensive concentration upon the newer developments, often loosely described as the "new science" of nutrition, has tended to produce, especially in the lay mind, a distorted conception of nutrition as being primarily a matter of supply of vitamins, either directly or through irradiation, and of minerals. This has led to the widespread folly of the indiscriminate addition of vitamin and mineral preparations to all kinds of diets, regardless of whether such additions will remedy an existing deficiency or imperfection of "balance" in the diets—the only conditions under which benefit from the additions can be expected. This practice is the more to be deprecated because there is always the risk that excess supplies of certain factors brought about by such additions may be actually detrimental in their effects. This certainly applies, for example, in the case of the supply of lime, an excess of which has been found in experiments with poultry to produce a form of lameness.

The newer knowledge of nutrition has in no sense replaced the old science, but has merely amplified it and made its application to practice more precise and efficient. To say that "feeding by calories" is out of date would be just as absurd as to say that improvements in the motor-car engine have eliminated the necessity for a supply of fuel in the tank.

Just as the motor engine works smoothly only when all the essentials are present and working together harmoniously in a co-ordinated effort, so also successful nutrition cannot be

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explained in terms of any one factor but must be attributed to the co-ordinated action of the whole complex of factors embodied in the ration, supplemented by other factors (apart from food) that are provided by good management. If a ration be imperfect the effects of adding different materials to it will be determined by the extent to which they remedy its deficiencies or improve its "balance." We can predict, for example, that the addition of linseed cake to a maize diet will be less successful than the addition of an equal amount of protein in the form of bean meal, because certain "amide" deficiencies in the make-up of the proteins of maize are remedied more effectively by the bean proteins than by the linseed proteins, and the protein "quality" of the whole ration is thereby made better in the former than in the latter case. To borrow a word from the vocabulary of the breeder, the bean proteins "nick" better with the maize proteins than do those of linseed. One would not be warranted, however, in drawing from this individual comparison the general conclusion that bean meal is a better food than linseed cake, since the reverse would probably be found to hold true if the maize were replaced by other foods, or mixtures of foods, whose proteins "nick" better with those of linseed.

The same general considerations must obviously apply also in relation to the use of vitamin and mineral supplements. If they remedy a deficiency in the ration they will be effective; if there is no deficiency they will be either ineffective or possibly even harmful. Every ration ought therefore to be studied separately before "supplements" are added. If the feeder's knowledge is not adequate for the purpose, advice is now everywhere available from the public advisory services.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British ..	6 7	0 8	5 19	72	1 8	0·89	9·6
Barley, British feeding	5 10	0 8	5 2	71	1 5	0·76	6·2
" Canadian No.4							
Western ..	5 3†	0 8	4 15	71	1 4	0·71	6·2
Persian ..	5 0*	0 8	4 12	71	1 4	0·71	6·2
Polish ..	5 10	0 8	5 2	71	1 5	0·76	6·2
Russian ..	5 10	0 8	5 2	71	1 5	0·76	6·2
Oats, English, white ..	6 3	0 8	5 15	60	1 11	1·03	7·6
" black ..							
and grey ..	6 0	0 8	5 12	60	1 10	0·98	7·6
" Scotch, white ..	6 12	0 8	6 4	60	2 1	1·12	7·6
" Canadian, No. 2							
Western ..	7 7*	0 8	6 19	60	2 4	1·25	7·6
" Canadian, No. 3							
Western ..	6 5†	0 8	5 17	60	1 11	1·03	7·6
" Canadian,							
mixed feed	5 17	0 8	5 9	60	1 10	0·98	7·6
Maize, Argentine ..	4 3	0 7	3 16	78	1 0	0·54	7·6
" Danubian,							
Gal. Fox	4 7†	0 7	4 0	78	1 0	0·54	7·6
" South African,							
No. 4, yellow flat	4 10†	0 7	4 3	78	1 1	0·58	7·6
" South African,							
No. 2, white flat	4 15†	0 7	4 8	78	1 2	0·62	7·6
Beans, English, Winter	5 10§	0 16	4 14	66	1 5	0·76	19·7
Peas, English, Blue ..	9 0§	0 14	8 6	69	2 5	1·29	18·1
" Japanese ..	19 0†	0 14	18 6	69	5 4	2·86	18·1
Dari ..	6 10†	0 7	6 3	74	1 8	0·89	7·2
Milling Offals:—							
Bran, British ..	6 0	0 15	5 5	43	2 5	1·29	9·9
" broad ..	6 10	0 15	5 15	43	2 8	1·43	10·0
Middlings, fine,							
imported	5 10	0 12	4 18	69	1 5	0·76	12·1
Weatings†	5 12	0 13	4 11	56	1 9	0·94	10·7
" superfine†	6 5	0 12	5 13	69	1 8	0·89	12·1
Pollards, imported	5 0	0 13	4 7	50	1 9	0·94	11·0
Meal, barley ..	6 15	0 8	6 7	71	1 9	0·94	6·2
" grade II	6 0	0 8	5 12	71	1 7	0·85	6·2
" maize ..	4 17	0 7	4 10	78	1 2	0·62	7·6
" South ..							
African ..	4 15	0 7	4 8	78	1 2	0·62	7·6
" germ ..	4 17	0 10	4 7	84	1 0	0·54	10·3
" locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
" bean ..	8 0	0 16	7 4	66	2 2	1·16	19·7
" fish (white) ..	14 0	2 0	12 0	59	4 1	2·19	53·0
Maize, cooked, flaked	5 7	0 7	5 0	84	1 2	0·62	9·2
" gluten feed ..	5 5	0 12	4 13	76	1 3	0·67	19·2
Linseed cake—							
English, 12% oil	7 17	0 19	6 18	74	1 10	0·98	24·6
" 9% "	7 7	0 19	6 8	74	1 9	0·94	24·6

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Linseed cake (<i>contd.</i>)							
English 8% oil	7 2	0 19	6 3	74	1 8	0·89	24·6
" 6% "	7 12	0 19	6 13	74	1 10	0·98	24·6
Soya-bean cake, 5½% oil	8 2	1 7	6 15	69	1 11	1·03	36·9
Cottonseed cake, English, Egyptian seed, 4½% oil ..	4 10	0 17	3 13	42	1 9	0·94	17·3
Cottonseed cake, Egyptian, 4½% oil	4 2	0 17	3 5	42	1 7	0·85	17·3
Cottonseed cake, decorticated, 7% oil	7 0†	1 7	5 13	68	1 8	0·89	34·7
Cottonseed meal, decorticated, 7% oil	7 0†	1 7	5 13	70	1 7	0·85	36·8
Coconut cake, 6% oil	6 5	0 17	5 8	77	1 5	0·76	16·4
Ground nut cake, decorticated, 6-7% oil	7 5	1 7	5 18	73	1 7	0·85	41·3
Ground nut cake, imported decorti- cated, 6-7% oil ..	6 15	1 7	5 8	73	1 6	0·80	41·3
Palm-kernel cake 4½-5½% oil ..	6 2†	0 11	5 11	73	1 6	0·80	16·9
Palm-kernel cake, meal, 4½% oil ..	6 0†	0 11	5 9	73	1 6	0·80	16·9
Palm-kernel meal, 1-2 %oil ..	5 7	0 11	4 16	71	1 4	0·71	16·5
Feeding treacle ..	4 12	0 8	4 4	51	1 8	0·89	2·7
Brewers' grains, dried ale ..	4 17	0 10	4 7	48	1 10	0·98	12·5
Brewers' grains, dried porter ..	4 10	0 10	4 0	48	1 8	0·89	12·5
Dried sugar beet pulp (a) ..	5 7	0 5	5 2	66	1 7	0·85	5·2

(a) Carriage paid in 5-ton lots.

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of February, 1935, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £9 per ton, then since its manurial value is 19s. per ton as shown above, the

FARM VALUES OF FEEDING STUFFS

cost of food value per ton is £8 1s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 11d.; P₂O₅, 2s. 1d.; KO₂, 3s. 4d.

FARM VALUES

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow:—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6·2	5 6
Maize	78	7·6	4 3
Decorticated ground-nut cake	73	41·3	7 0
„ cottonseed cake	68	34·7	7 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.25 shillings, and per unit protein equivalent, 1.62 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9·6	5 6
Oats	60	7·6	4 7
Barley	71	6·2	4 19
Potatoes	18	0·8	1 4
Swedes	7	0·7	0 10
Mangolds	7	0·4	0 9
Beans	66	19·7	5 14
Good meadow hay	37	4·6	2 14
Good oat straw	20	0·9	1 6
Good clover hay	38	7·0	2 19
Vetch and oat silage	13	1·6	0 19
Barley straw	23	0·7	1 10
Wheat straw	13	0·1	0 16
Bean straw	23	1·7	1 12

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

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Agricultural Scholarships

THE Ministry invites applications for the undermentioned scholarships which are being offered for award this year under the scheme of scholarships for the sons and daughters of agricultural workmen and others:—

Ten Senior Scholarships, tenable at Agricultural Colleges or University Departments of Agriculture, for diploma or degree courses in an agricultural subject, or at Veterinary Colleges for courses in veterinary science ;

120 Junior Scholarships and *10 Extended Junior Scholarships* (for those who have already held Junior Awards), tenable at Farm Institutes or similar institutions, for courses not exceeding a year in duration, in agriculture, horticulture, dairying, or poultry husbandry.

The scholarships are open to the sons and daughters of agricultural workmen or of working bailiffs, smallholders and other rural workers whose means and method of livelihood are comparable with those of agricultural workmen, and to persons who are themselves *bona fide* workers in agriculture. The value of the awards is such that neither the recipients nor their parents are normally required to make any contribution towards the cost of the training provided. The usual method of selection is by interview, no written examination being required, but candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of instruction and must also intend to follow an agricultural pursuit on completion of their training.

The scheme under which these scholarships are awarded has now been in operation for 14 years, and assistance has been granted for some 1,500 persons. Many past students have succeeded in improving their positions substantially and a number now hold important posts (scientific and otherwise) in the industry; for example, a smallholder's son now holds an appointment as Pathologist to a Colonial Research Institute; two former agricultural labourers are now employed, one as Marketing Assistant in the Agricultural Economics Department of a University, and the other as manager of a large farm; a former dairymaid is now an Instructress at a Farm Institute. Of those who have been trained no fewer than 9 per cent. now hold administrative, teaching or research appointments of an agricultural nature, while a further 19 per

MISCELLANEOUS NOTES

cent. occupy posts of a supervisory character, such as managers of farms, nurseries, dairies, and so on. It will be seen, therefore, that the scholarships afford exceptional opportunities to those who are able to obtain them and take full advantage of the education provided.

Full information concerning the scheme, including forms of application and a leaflet outlining the types of career open to students who have completed courses of training, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or locally from the offices of County Councils. The latest date for submitting applications is April 30, 1936.

The Agricultural Index Number

THE February general index number of the prices of agricultural produce was 118 (base 1911-13=100), i.e., 1 point below that of the preceding month, but 3 points higher than in February, 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the month is 123.) Compared with January, wheat, oats, fat cattle, fat pigs and cheese were the principal commodities which showed a rise in price, whereas barley and eggs declined in value.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	—
April	123	117	105	111	119	—
May	122	115	102	112	111	—
June	123	111	100	110	111	—
July	121	106	101	114	114	—
August	121	105	105	119	113	—
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Grain. Wheat at an average of 6s. 4d. per cwt. and oats at 6s. per cwt. were both higher by 1d.; the index for the former was unchanged at 85, but that for the latter fell from 87 to 85, the increase in price during the base period having been relatively more pronounced. (The addition of "deficiency payments" under the Wheat Act, 1932, makes the wheat

MISCELLANEOUS NOTES

index 125.) The February average for barley at 7s. 11d. per cwt. was lower by 2d., and the index declined by 3 points to 98. A year ago wheat averaged 4s. 8d. per cwt., barley 8s. 2d., and oats 7s., the respective indices being 63, 101 and 99.

Live Stock. During the period under review, quotations for fat cattle were well maintained, and the average for second quality, 33s. per live cwt., shows a rise of 1d. on the month and 1s. 8d. on the figure for February, 1935. The increase of 1d., however, was less than that recorded in the corresponding months of the base years, and the index declined from 97 to 96. (The effect of adding the cattle subsidy would be to place the index at 110.) Fat sheep, at 9½d. per lb. for second quality, were again unchanged in price, but, as a rise occurred in the base period, the index dropped 8 points to 119. Baconers at 10s. 10d. per score, and porkers at 12s. 1d., appreciated by 8d. and 3d. respectively; the index for the former rose from 107 to 111, whilst that for porkers stood at 114. Dairy cows were cheaper by 6s., and store cattle by 5s. per head, the indices being 2 points lower in each instance. Store sheep averaged 40s. 10d., and store pigs 29s. 1d., as against 38s. 9d. and 28s. 1d., respectively, a month earlier, but, owing to larger increases having occurred during the base period, the indices fell from 105 to 104 for sheep and from 134 to 129 for pigs.

Dairy and Poultry Produce. The regional contract price for milk continued at 1s. 5½d. per gal. during February and the index remained at 171. Butter declined slightly in price, but the index was unchanged. The seasonal fall of 1½d. per doz. in the price of eggs was less than that in the base period, and the index advanced 3 points to 118. Quotations for cheese were higher by 2s. 6d. per cwt., the index rising from 93 to 95. Poultry prices, apart from those for geese, which declined, showed no alteration, but, on account of upward movements in the base years, the combined index at 122 was 5 points below that recorded in January.

Other Commodities. Average quotations for potatoes were maintained at last month's levels, i.e., double pre-War value, the index being 200. Hay was practically unchanged in price, the combined index remaining at 83. Wool at 1s. 0½d. per lb. was ½d. above the price in January, but this increase was similar to a rise in the base years, and the index was unaltered.

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Monthly Index numbers of prices of individual commodities (corresponding months of 1911-13=100.)

Commodity	1934	1935			1936	
	Feb.	Feb.	Nov.	Dec.	Jan.	Feb.
Wheat	60	63	78	77	85	85
Barley	113	101	101	100	101	98
Oats	91	99	87	83	87	85
Fat cattle ..	103	91	92	91	97	96
„ sheep ..	112	134	120	119	127	119
Bacon pigs..	129	120	93	98	107	111
Pork „ ..	135	125	103	110	115	114
Dairy cows..	101	102	103	104	105	103
Store cattle	92	84	90	92	94	92
„ sheep ..	91	109	112	106	105	104
„ pigs ..	159	142	129	131	134	129
Eggs	95	96	109	110	115	118
Poultry ..	118	124	118	120	127	122
Milk.. ..	161	171	171	171	171	171
Butter	86	86	97	93	93	93
Cheese	115	94	87	87	93	95
Potatoes ..	100	116	160	185	201	200
Hay.. ..	79	102	84	84	83	83
Wool	100	87	91	91	96	96

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	128*	117*	124	127	127	125
Fat cattle ..	—	105	106	105	111	110
General Index	117	122	119	121	125	123

* Superseding figures previously published.

Beans

THE new Bulletin on Beans, recently issued by the Ministry, should prove of much assistance to growers who are concentrating their energies on some of the more popular vegetable crops for the home market. The Bulletin is No. 87 in the series and follows similar lines to Bulletin No. 81, also recently issued on the subject of Green Peas. It is recognized, of course, that beans are not so extensively grown as peas, though their several species and sub-divisions constitute important crops. Bean-growing also, like pea-growing, received a stimulus from the recent great development of the home canning industry, the products of which are now so much favoured in this country.

The Bulletin traces the history of the use of the various kinds of beans for human food as far as it is known from the

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earlier English and foreign writings. The beans cultivated in the sixteenth century seem very much the same as those cultivated to-day, though ways and means of cultivation may have been different.

The chief kinds dealt with are broad beans, French or kidney beans, and runner beans. The Lima bean and soya bean are also mentioned among the miscellaneous classes as items of interest, particularly the latter, which is said to possess the highest protein content of any known legume (40-45 per cent.), though neither seems able, as a regular thing, to be successfully grown in this country. There is a separate chapter on the pests and diseases of beans, suitable treatment of affected crops and means to control the pests being prescribed.

The Bulletin may be obtained, price 2s. net. (2s. 2d. by post) from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, or through any bookseller.

Farm Workers Minimum Rates of Wages. Meetings of the Agricultural Wages Board were held at Kings Buildings, Smith Square, London, S.W.1, on March 10 and 16, 1936. The Board received notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Devonshire.—An Order fixing minimum and overtime rates of wages to come into operation on March 22, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until March 20, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. per week of 52 hours in summer, except in the week in which Whit Monday falls when the hours are 43, and 50 hours in winter, except in the weeks in which Good Friday and Easter Monday fall when the hours are 41, and in the week in which Christmas Day and Boxing Day fall when the hours are 32, with overtime unchanged at 8½d. per hour on weekdays and 10d. per hour on Sundays, and for all overtime employment on the hay and corn harvests. The minimum rate for female workers of 18 years of age and over is 6d. per hour for a week of 48 hours, except in the weeks in which Good Friday, Easter Monday and Whit Monday fall when the hours are 40 and in the week in which Christmas Day and Boxing Day fall when the hours are 32, with overtime at 7½d. per hour instead of 6d. per hour for all time worked as formerly.

Durham.—An Order fixing minimum and overtime rates to come into force on May 14, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until May 13, 1937. The minimum rates for male workers of 21 years of age and over are :—(1) horsemen who are householders, 33s. (as at present) per week of 50 hours, with, in addition, 7s. per week to cover all time spent in attention to horses ; (2) horsemen who are not householders, 32s. (as at present) per week of 50 hours with, in addition, 3s. 6d. per week to cover all time spent in attention to horses ; (3) horsemen who are boarded and lodged by their employers, 32s. (as at present) per week of 50 hours and all time spent in attention

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to horses; (4) stockmen and shepherds, per week of the hours customarily spent in attention to stock, householders 44s. (as at present), non-householders 37s. 10½d. (as at present), workers boarded and lodged 36s. (as at present); (5) casual workers 6d. per hour (as at present); and (6) other male workers 31s. (instead of 29s. as at present) per week of 50 hours. The overtime rate for all classes of male workers of 21 years of age and over other than casual workers is 9d. (instead of 8d. as at present) per hour, except for overtime employment on Saturday afternoon, Sunday, Christmas Day and Good Friday, when the rate is 10d. per hour (instead of 9d. as at present). The minimum rates for female workers of 18 years of age and over are unchanged at 2s. 6d. per day of 8 hours, with overtime at 4d. per hour.

Herefordshire.—An Order fixing minimum and overtime rates of wages to come into force on May 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until April 30, 1937. The minimum rates are:—(1) in the case of male workers of 21 years of age and over employed wholly or mainly as bailiffs, waggoners, stockmen or shepherds, 36s. (as at present) per week (including Sunday) for all time necessarily spent on the immediate care of animals (not exceeding 60 hours), with overtime unchanged at 9d. per hour, except for employment on Christmas Day and Good Friday, where a worker has completed less than 60 hours in the weeks in which those holidays fall, when the rate is 2d. per hour; (2) for other male workers of 21 years of age and over, 31s. 6d. (instead of 31s. as at present) per week of 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, and 54 hours in summer, except in the week in which Good Friday falls when the hours are 44½, with overtime at 9d. per hour on weekdays and 10d. per hour on Sundays (as at present); and (3) for female workers of 18 years of age and over 5d. per hour (as at present) with overtime at 6d. per hour, except for employment on Christmas Day and Good Friday where a whole time worker has completed less than 46½ hours in the weeks in which those holidays fall when the rate is 1½d. per hour.

Kent.—An Order fixing minimum and overtime rates of wages to come into force on March 29, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 27, 1937. The minimum rates for male workers of 21 years of age and over employed wholly or mainly as horsemen, stockmen or shepherds, are 33s. 6d. per week of 52 hours, except in the week in which Easter Monday (instead of Good Friday as at present) falls when the hours are 42½ and in the week in which Christmas Day and Boxing Day fall when the hours are 33 (instead of 42½ hours in the week in which Christmas Day falls as at present), with in addition 8d. per hour for all employment on customary duties in excess of these hours up to 60 hours per week. The minimum rates for other male workers of 21 years of age and over are 33s. per week of 52 hours in summer except in the week in which Easter Monday (instead of Good Friday as at present) falls, when the hours are 42½, and 48 hours in winter except in the week in which Christmas Day and Boxing Day fall when the hours are 30 (instead of 39 hours in the week in which Christmas Day falls, as at present). The overtime rates for all classes of male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 10d. per hour on Sundays, Easter Monday, Christmas Day and Boxing Day (instead of on Sundays, Good Friday and Christmas Day as formerly) except

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that the overtime rate payable to horsemen, stockmen and shepherds whilst employed on their customary duties is 9d. per hour. The minimum rate for female workers of 18 years of age and over is unchanged at 6d. per hour with overtime at 6½d. per hour on weekdays and 7d. per hour on Sundays, Easter Monday, Christmas Day and Boxing Day (instead of on Sundays, Good Friday and Christmas Day as formerly).

Somerset.—An Order continuing the existing minimum and overtime rates of wages from March 29, 1936 (i.e., the day following that on which the existing rates are due to expire), until March 27, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. per week of 52 hours in summer, except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall when the hours are 42½, and 50 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 32½, with overtime at 9d. per hour except for overtime employment on the hay and corn harvests when the rate is 10d. per hour. Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day fall to meet cases where alternative holidays are given within 14 days of such holidays. The minimum rate for female workers of 21 years of age and over is 6d. per hour for all time worked.

Suffolk.—An Order continuing the existing minimum and overtime rates of wages for male workers from April 1, 1936 (i.e., the day following that on which the existing rates are due to expire), until March 27, 1937. The minimum rates for male workers of 21 years of age and over are 31s. per week of 50 hours in summer, except in the week in which Good Friday falls when the hours are 41½, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, with in addition in the case of horsemen, cowmen and shepherds of 18 years of age and over a sum of 6s. per week to cover employment up to 10 hours per week in connexion with the immediate care of animals. The overtime rate for all male workers of 21 years of age and over is 9d. per hour.

Sussex.—An Order fixing minimum and overtime rates of wages to come into force on April 6, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 21, 1937. The minimum rates for male workers of 21 years of age and over are :—(1) for workers employed wholly or mainly as horsemen, cowmen, stockmen or shepherds 37s. 6d. per week (instead of 37s. as at present) of 58 hours except in the weeks in which Good Friday, Whit Monday and Christmas Day fall when the hours are 50; and (2) for other workers 32s. 6d. (instead of 32s. as at present) per week of 52 hours in summer, except in the weeks in which Good Friday and Whit Monday fall when the hours are 44, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 40. The overtime rates for all classes of adult male workers are unchanged at 9d. per hour on weekdays and 10½d. per hour on Sundays. The minimum rate for female workers of 18 years of age and over is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays as at present.

Radnor and Brecon.—An Order fixing minimum and overtime rates of wages to come into force on May 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in

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operation until October 31, 1936. The minimum rates for male workers of 21 years of age and over are 31s. (instead of 30s. as at present) per week of 50 hours in winter and 54 hours in summer, with overtime unchanged at 9d. per hour. For female workers of 18 years of age and over the minimum rate is unchanged at 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays as at present.

Enforcement of Minimum Rates of Wages.—During the month ending March 13, 1936, legal proceedings were taken against twelve employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of wages ordered	No. of workers involved
Cornwall ..	Truro ..	£ s. d. 0 10 0	£ s. d. —	£ s. d. 10 0 0	1
Devon ..	Moreton-hampstead	2 2 0	0 8 0	1 19 1	1
Northumberland	Amble ..	—	8 0 0	20 0 0	1
Salop ..	Newport ..	12 0 0	0 10 0	92 0 0	4
Somerset ..	Shepton Mallett	5 0 0	1 1 0	30 0 0	1
Yorks, E. R.	Withernsea	8 0 0	—	21 12 5	4
Glamorgan	Bridgend..	5 0 0	—	25 0 0	1
"	Bridgend..	2 0 0	—	8 1 9	1
Pembroke and Cardigan	Aberayron	0 10 0	0 10 0	9 7 0	1
" "	Fishguard	1 0 0	—	25 0 0	1
" "	Milford Haven	3 0 0	1 1 0	32 0 0	1
" "	Narberth..	3 3 0	2 2 0	18 0 0	1
" "	Tregaron..	0 10 0	0 4 0	16 0 0	1
		42 15 0	13 16 0	309 0 3	19

Foot-and-Mouth Disease.—No outbreaks of Foot-and-Mouth Disease have been confirmed since January 26. At the time this issue of the JOURNAL went to press no part of Great Britain was subject to Foot-and-Mouth Disease (Infected Area) restrictions.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Berkshire : Miss F. E. Sutherland, N.D.D., has been appointed Assistant Dairy Instructor, *vice* Mr. C. Kingsley, N.D.A., N.D.D.

Mr. G. T. Chalmers, N.D.D., has been appointed Assistant Dairy Instructor.

Devonshire : Miss S. J. Shotton, N.D.D., has been appointed Instructor in Rural Science (Dairying and Poultry-keeping).

NOTICES OF BOOKS

Hampshire: Miss F. G. Crosthwaite, N.D.D., has been appointed Assistant Dairy Instructor, *vice* Miss M. F. Griffiths, N.D.D., B.D.F.D.

Mr. C. Kingsley, N.D.D., has been appointed Assistant County Dairy Officer.

Leicestershire: Mr. M. B. Smithson has been appointed County Poultry Instructor, *vice* Mr. L. J. Shelley.

Somersetshire: Mr. D. Rowe, N.D.A., has been appointed Assistant Agricultural Organizer, *vice* Mr. A. Murchie, B.Sc. (Agric.), N.D.A., N.D.D.

Mr. R. A. Engledow, N.D.H., has been appointed Instructor in Horticulture, *vice* Mr. J. Glavin, F.R.H.S., retired.

Mr. H. J. Ward has been appointed Assistant Instructor in Horticulture at the County Farm Institute, Cannington, *vice* Mr. R. A. Engledow, N.D.H.

Sussex East: Mr. F. I. Williams, N.D.A., N.D.D., has been appointed Junior Agricultural Lecturer and Warden of the School of Agriculture, Plumpton, *vice* Mr. M. E. B. Neal, B.Sc.

Wiltshire: Mr. J. A. Wyatt, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Temporary Assistant Instructor in Dairying, *vice* Mr. W. A. Scriven, N.D.A., N.D.D.

NOTICES OF BOOKS

Dynamometers for Agricultural Research. By J. S. Wilson, M.A., B.Sc., A.Inst.P. Pp. 12. (Oxford: Institute for Research in Agricultural Engineering.)

This paper appeared originally in *The Engineer* of October 4, 11 and 18, 1935. While it is perhaps hardly intended for the farmer, everyone who is connected with agricultural engineering will be grateful to Mr. Wilson for his very precise description of the various types of dynamometer and of the methods of using them. He gives a brief resumé of the history of the development of these measuring implements, and draws attention to the complex factors involved in accurately determining the tractive effort required to haul different types of agricultural implements through the soil. Special types of dynamometers have been developed at the National Physical Laboratory; for the S.M.M.T. Tractor Trials at Shrewsbury in 1920; at Rothamsted; at the Oxford Institute for Research in Agricultural Engineering; and in other countries. These types fall into two main groups, but it is unnecessary to describe them here; all that is required will be found in Mr. Wilson's paper, which deserves to be widely read by agricultural engineers, whether working in the laboratory or in the field.

The Dairy Industry and the Agricultural Adjustments Act. By J. D. Black. Pp. xiv + 520. (London: Faber & Faber, Ltd., Washington: The Brookings Institution. 1935. Price 13s. 6d.)

The author lays clearly before his readers the condition of the dairy industry in the United States of America, that led to the demand for the passing of the Agricultural Adjustments Act in 1933. He deals with the efforts made by both State and Federal authorities to control the industry, giving a clear idea of the results obtained, and reasons for successes and failures. After the passing of the Act it was evident that the main efforts were centred on the control of the liquid milk trade, but later on endeavours were made to come to agreement regarding the control of dairy products, a part of the Agricultural Department Act programme that has, apparently, not been well administered. The

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book should be read by all who consider that the difficulties facing the British dairy farmer can be solved by the introduction of State or semi-State control.

The Chemistry of Milk. By W. L. Davies, Ph.D., M.Sc., F.I.C. Pp. xii + 522, 26 Figs. and 126 Tables. (London: Chapman & Hall. 1936. Price 25s.)

This book is one of a series of monographs on applied chemistry compiled by recognized specialists under the editorship of Dr. E. Howard Tripp. It is generally realized that the existing need for specialization renders it increasingly difficult to keep abreast of developments and advances in technical knowledge, particularly in the case of milk, and the author has been set a difficult and intricate task in endeavouring to review and select essential material from the mass of research literature on this subject. The contents are conveniently arranged in five parts, dealing with the composition of milk, the constituents of milk, the physical chemistry of milk, the chemistry of milk processing, and the nutritive value of milk. The detailed study of each section indicates that the work should be of interest to chemists, physiologists, nutritionists, agriculturists, the medical profession, and all who are interested, directly or indirectly, in milk and milk products. There is an excellent bibliography at the end of each section, together with subject and author indexes, amounting in all to about 1,400 references. The general method of treatment is excellent, and the text is profusely supplemented by tables and diagrams.

The Exploration of England: A Select Bibliography of Travel and Topography, 1570—1815. By G. E. Fussell. Pp. 56. (London: The Mitre Press. 1935. Price 2s.)

Much industry has been expended in the compilation of this useful guide to 245 years of English topographical literature. As indicated by the subtitle, the book does not claim to be a complete list of topographical works, travellers' letters and journals published during the period, but all the more important publications are noted. The earliest writers belong to an age when communications were distinctly difficult. Their peregrinations were usually prompted by necessity, and their observations seem to be largely concerned with the difficulties encountered *en route*, a characteristic that recurs in the diary of Celia Fiennes as late as the reign of William and Mary. With the improvement of roads and inns in the eighteenth century the middle class set out to see the country, not always in a haphazard manner, as the well-known "descriptions" of Arthur Young, William Gilpin and William Marshall testify. The arrangement of the bibliography is chronological, the date of preparation being preferred to that of publication as more important from the student's point of view. Mr. Fussell and his collaborators have produced a painstaking and useful piece of research.

The Girl in the Rural Family. By Norah Miller, B.S., M.S. Pp. ix + 108. (Chapel Hill: University of North Carolina Press. London: Oxford University Press. 1935. Price 7s.)

The author of this book, as an officer of the Virginia Agricultural and Home Economics Extension Service, is well qualified to describe the life led by the girls in the rural communities of the Southern States. She points out that the economic difficulties of the last half-dozen years, by lessening chances of employment outside, have increased the importance of the home work of rural women. It is significant, she thinks, that the 1930 Census listed home-making as a business (the home-maker having

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previously been designated "unemployed"). The book is a strong plea for better preparation for such essential work. The studies of the life open to a girl, on leaving school, in various rural groups (cotton farmers, potato farmers, tobacco farmers and others) certainly suggest that there is a considerable wastage of energy and ability under present conditions. The author advocates a programme of transitional education for the young people of the rural communities, and considers that the Agricultural and Home Economics Extension Service, by providing a variety of agricultural club-work for boys and girls (corresponding to the Young Farmers' Clubs in Great Britain), is the proper organization to deal with this.

Plant Viruses. By Kenneth M. Smith, D.Sc., Ph.D. Pp. ix + 107, and 11 Figs. (London: Methuen & Co., Ltd. 1935. Price 3s. 6d.)

This small book aims at bringing to the notice of scientific workers, particularly botanists and entomologists, some of the more interesting and important facts concerning plant viruses. After an introductory chapter dealing with historical matters, as well as with the characteristics of plant diseases due to viruses, virus problems in different countries, increasing spread and economic importance, there follow nine other chapters. In them are given accounts of the methods of study of plant viruses, of their natural modes of transmission, of the virus in the host (plant and insect) and outside of it, and of immunity from virus infection. In addition, the nature and classification of plant viruses is dealt with and the question of control discussed. Finally, some comparisons are made between plant and animal viruses. The author is a well-known specialist on plant virus problems and the information given is succinct, accurate and up to date. For those who desire to know more of the matters touched upon, a very useful list of references is supplied, including both books and original papers. To anyone wishing to have in small compass the salient facts about plant viruses this handy little volume can be cordially recommended.

Regions of Distribution of the Most Important Weed Species in the U.S.S.R. Edited by W. Ljubimenko, A. Maltzev, R. Rojewitz and I. Wassiltchenko. General Editor: A. H. Volkov. Pp. 276 and 155 Maps. (Moscow and Leningrad: State Printing Office; Section of Soviet and Collective Farms Literature. 1935.)

This book is an example of the importance attached in other countries to the incidence of weeds in agriculture, and indicates that the five editors must have been set a very extensive piece of work. The 155 maps show the regional distribution of 150 of the more important species of weeds in the U.S.S.R., the frequency of each species being given for the separate territories in which they occur. The text deals generally with the dependence of distribution on natural conditions, and on conditions of cultivation; and with the distribution of biological types. The language used is, of course, Russian, but an English summary is included for the benefit of the wider public to whom such a work is likely to appeal. Very many of the species dealt with are among the commoner and most troublesome weeds of Great Britain.

Report of the Secretary of Agriculture (United States), 1935. Pp. 120. (Washington, D.C.: Superintendent of Documents, United States Government. Price [paper cover] 10 cents.)

This report, as its title denotes, is the Secretary of Agriculture's latest annual survey of the condition of farming in the United States. It is a condensed account of the major facts and events of 1935, amply illustrated by statistical material incorporated in the text. Among the topics

WIRELESS TALKS TO FARMERS

discussed are prices and production of the leading crops, farm income and receipts from foreign trade, land values and agricultural credit, drought and soil conservation and the relation of agricultural recovery to recovery in general. Mr. Wallace takes the opportunity to reiterate his well-known views that the interests of American agriculture and industry are indissoluble, and that agriculture should aim at a "balanced abundance" under continued "adjustment" control, rather than that farmers should engage in competitive over-production to secure larger shares of a shrunken total market. Some indication of the results of policies directed to this end is to be found in the statistics for gross agricultural income. This quantity (together with benefit payments, etc., in the later years) rose from \$5.3 milliards in 1932 to \$7.3 milliards in 1934, and a provisional estimate of \$7.8 milliards in 1935.

WIRELESS TALKS TO FARMERS, APRIL, 1936

<i>Station</i>	<i>Date</i>	<i>Time: p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National. .	1, 8, 15, 22 29	7.5	Prof. J. A. Scott Watson and other experts.	For Farmers only.
West ..	9	6.30	Messrs. A. W. Ling and W. D. Hay.	For Western Farmers in Particular: The Sheep Position in the West Country.
	23	6.30	Mr. A. W. Ling	For Western Farmers in Particular.
North ..	9	6.50	Mr. W. E. Shewell- Cooper	Chrysanthemums.
	17	8.0	Mr. W. E. Mercer and Mr. Kenneth Lishman (an In- come Tax expert)	Income Tax for Farmers.
	24	6.30	Mr. W. E. Shewell- Cooper, a Dur- ham expert on leeks, and an onion-grower from Cheshire	Onions and Leeks for Show
Welsh ..	5	7.55	Mr. T. H. Harris	The Farmer's World (4): The Welsh Terrier.
Scottish ..	2	6.30	Mr. R. L. Scarlett	For Scottish Farmers in Particular.
	9	8.15	Mr. A. S. B. Wilson	Talk to Scottish Farmers: The Des- truction of Weeds.
	16 23		Not yet fixed Mr. A. W. Ander- son	For Scottish Farmers. Talk to Scottish Farmers: Sale by Grade and Dead Weight.
Midland ..	2, 16, 30	6.30	Mr. W. B. Thomp- son	For Midland Farmers.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 2 May, 1936

NOTES FOR THE MONTH

Extension of Unemployment Insurance to Workers in Agriculture

THE Unemployment Insurance (Agriculture) Act, 1936, which received the Royal Assent on April 9, extends the unemployment insurance scheme to agriculture (including horticulture and forestry), subject to certain modifications to suit the special needs of the agricultural industry.

The scheme came into operation, for purposes of contributions, on May 4, 1936, and benefit under the Act will be payable as from November 5 next. For men of 21 or over, the rate of contribution payable by employer and worker will be 4½*d.* a week each, and that in the case of women, 4*d.*, and the rates of benefit will be 14*s.* for men and 12*s.* 6*d.* for women, with lower rates of contribution and of benefit for younger workers. Dependants' benefit in respect of adult dependants will be 7*s.* a week and for each child 3*s.* per week. In order to qualify for benefit, twenty contributions must have been paid in the last two years. Once this condition is satisfied, the length of time for which a claimant may draw benefit will be determined by the number of agricultural contributions standing to his credit. Benefit is payable at the rate of two weeks' benefit in respect of the first ten contributions and three days' benefit for each additional contribution. There is provision by which, in the case of a worker who receives extra benefit in respect of dependants, the maximum rate payable to him must not exceed 30*s.* per week.

The Act provides for the repayment of 25 per cent. and 12½ per cent., respectively, of the contributions paid on account of workers employed on yearly and half-yearly hirings. Employers and workers who desire to take advantage of this provision must, not later than twenty-eight days after the

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beginning of the hiring contract, furnish the local office of the Ministry of Labour with a joint declaration on a special form that they have entered into such contract.

The scheme does not apply to persons not under a contract of service, e.g., to persons working on their own account (although the Minister of Labour is empowered to make regulations extending it to such persons). Near relatives of the employer (husband or wife, son or daughter, mother or father, son-in-law or daughter-in-law, etc.) will not be insurable. Private domestic service is not covered: this applies to ordinary household servants, game keepers, private grooms, hunt servants and the like. Persons not domiciled in the United Kingdom who are ordinarily resident outside the United Kingdom are excluded from the scheme; but their employers must pay the employer's contribution.

Although employment in horticulture is insurable under the Act, the scheme does not apply in the case of private gardeners (i.e., those employed other than in a trade or business carried on for gain or by a Local Authority, Institution, Society, Club or similar body). The question whether the employment of such persons should be included among insurable employments is to be considered by the Unemployment Insurance Statutory Committee.

Regulations are being issued by which the employments excepted from Health Insurance (the harvesting of fruits, flowers, peas or potatoes, the tying, training or picking of hops, or peeling onions, unless the person so employed is at the time of entry in the employment already insured, and the employment of persons engaged in milking in cases where such persons are not ordinarily otherwise employed by the employer for whom the milking is performed) are excepted from unemployment insurance.

Workers covered by the scheme should make application for unemployment books as soon as possible at the nearest local office of the Ministry of Labour (the address of which can be obtained from the local post office), where an explanatory leaflet, giving particulars as to the rates of contribution and of benefit and other information regarding the scheme, can be obtained. The Ministry of Labour is making special arrangements for getting the scheme started. Letters are being sent to all known employers of persons coming under the scheme, enclosing a leaflet outlining the provisions of the scheme, and explaining the procedure for obtaining unemploy-

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ment books. Special temporary offices are being opened, where necessary, during the next few weeks; and the Ministry is prepared, when distance from a local office makes personal attendance unreasonable, to make special arrangements for officers to visit farms for the purpose of issuing books, or for issuing them by post.

The Revision of Ordnance Survey Maps

AN Interim Report was recently issued by the Departmental Committee on the Ordnance Survey dealing with two important matters, viz. (1) the revision of Ordnance Survey maps for the purpose of town and country planning schemes, and (2) the conditions upon which the reproduction of Ordnance Survey maps should be permitted.

For the purpose of planning schemes—which at May 31 last were being prepared for over 17,000,000 acres in Great Britain—up-to-date plans* on the $\frac{1}{2500}$ scale are essential. From inquiries made by the Committee, it is estimated that, after allowing for plans (forming part of the above area) that require no revision and those that the local authorities have themselves brought up-to-date, there remain some 1,400 plans that fall to be revised by the Ordnance Survey. From the coming into force of a Resolution to prepare a scheme to the actual adoption of the scheme there is normally a period of two years; and an up-to-date map should be available at least five months before the expiration of this period. It will be appreciated, therefore, that the revision of these 1,400 plans is a matter of considerable urgency. In the ordinary course the preparation of a new edition of an Ordnance Survey plan occupies a period of nearly two years, and the Committee has been informed that the output of the Survey, with existing resources, could not by December 31, 1937, exceed 200 plans at most out of the total of 1,400. To solve the problem, the Committee recommends that the maximum practicable addition should be made to the staff of the Ordnance Survey at the earliest possible date and, further, that there should be prepared an interim edition of the plans, which, while omitting certain features, would contain sufficient details for town and country planning purposes. This latter course would materially reduce the period required for the preparation of a plan; and the effect of the adoption of both recommendations would, it is estimated, enable the immediate

* A "plan" on this scale covers an area of 960 acres.

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demands of town planning authorities to be satisfied by about the summer of 1938.

The Committee has considered the question of the use of air photographs as an aid to map revision, and in this connexion reviews the results of an experiment that was made in 1935. While satisfied that it is possible to produce from air photographs revised plans of the standard indicated above, it is pointed out that some of the photographs obtained suffered from certain defects that would have entailed revision on the ground before complete plans could have been produced. The Committee recommends that further experiments should be conducted in 1936, so as to put to the test the contention advanced that such defects can be avoided.

Under the second head of its inquiry the Committee arrives at the conclusion that new Regulations should be introduced providing for a uniform scale of charges applicable to all users of Ordnance Survey copyright material. The present concession whereby local authorities are allowed to produce a limited number of copies, without payment of royalty, from Ordnance Survey maps in which Crown copyright subsists, should, therefore, be withdrawn. The Appendix to the Report sets out the detailed proposals which the Committee recommends for adoption.

The Report is obtainable through any bookseller, or direct from H.M. Stationery Office, price 3*d.*, post free, 3½*d.*

Wheat Improvement in the Mediterranean Countries

THE following note has been communicated by the International Institute of Agriculture at Rome:

The results obtained in wheat improvement during the last few years are not only interesting from a scientific point of view but are also of considerable economic importance. As a matter of fact, the wheat campaign undertaken in Italy, the economic effect of which has drawn the attention of the whole world, is due to a considerable extent to the improvement of wheat varieties. The new varieties obtained in Tunis and Algiers will probably soon render France also independent of the importation of Manitoba wheat. Greece has also increased its annual wheat production by 1.5 million quintals in recent years, in the first place by breeding work, and also by the introduction of new varieties.

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The special importance of the Mediterranean countries from the point of view of wheat breeding, resides in the particular abundance of forms and varieties of wheat in these regions. Some of the countries may even be considered as the centre of origin of certain wheat species. Selection of those local varieties, as well as their crossing with imported varieties, has given excellent results, especially in Tunis. In Algiers and in Greece, Italian plant-breeding activity has produced the famous ultra-precocious varieties "Mentana" and "Ardito" of Professor Strampelli that have, in a short time, conquered a great part of the wheat-growing world.

Considering the great importance of these facts, the International Institute of Agriculture of Rome has initiated the publication, in its International Review of Agriculture, of a series of articles on wheat breeding in the different countries of the Mediterranean Basin.

Prize Essays in Agricultural Economics

THE Agricultural Economics Society has decided to offer two annual prizes of £10 and £5 respectively, for essays on subjects connected with the economics of agriculture. Competitors must be either students at recognized institutions or holders (of not more than two years' standing) of degrees and/or diplomas in agriculture and/or economics. Essays for the current year must be sent in by March 31, 1937, and must be on one of the following subjects:

- (a) Recent developments of methods of transport in their influence upon agricultural conditions.
- (b) "There is no such subject as Agricultural Economics any more than there is Cotton Economics or Mining Economics. The term only means a special application of Economic Theory to Agriculture."
- (c) The organization of British farming in relation to the progress and future development of farm mechanization.
- (d) Changes in the value of the agricultural output in Great Britain in relation to the number of persons employed and the earnings of the employees.
- (e) "The stimulation of consumption rather than the restriction of supplies must be the basis of British agricultural policy."
- (f) The future of producer-control under the Agricultural Marketing Acts.

Further particulars of the conditions can be obtained from the Honorary Secretary, The Agricultural Economics Society, University of Reading, 7, Redlands Road, Reading.

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Stud Goat Scheme, 1936-37

THE British Goat Society's scheme for the improvement of milch goats kept by cottagers, smallholders and others is being continued during the forthcoming breeding season, which extends from September 1 to February 28 next. Under this scheme, cottagers are able to procure the services of first-class stud goats for breeding purposes at a maximum fee of 4s. per service. The stud goats used must have been entered, or be considered suitable for entry, in the Society's Herd Book and they must have been bred from milk-producing stock. Owners who wish to have their stud goats registered under this scheme should make early application to the Secretary of the British Goat Society, Roydon Road, Diss, Norfolk, who will be pleased to furnish them with full particulars. Applicants need not be members of the Society.

Entries must be received on or before May 20, 1936, and goats submitted for approval must be available for inspection after that date at the premises at which it is proposed that they should stand at stud.

Colorado Beetle in Belgium and France

IN consequence of the spread of the Colorado Beetle into Belgium, the Minister of Agriculture and Fisheries has made an Order—The Importation of Plants (Amendment) Order of 1936—which imposes restrictions on the importation into this country from Belgium of certain kinds of horticultural produce. Similar restrictions are already in force in the case of horticultural produce from France. The new Order comes into force on May 1, 1936.

The following is a summary of its provisions:

- (a) A Colorado Beetle Certificate in one of two forms is required to accompany living plants, potatoes, raw vegetables and cider apples imported from Belgium.
- (b) The alternative forms of Colorado Beetle Certificate are (i) that the produce was grown outside a radius of 50 kilometres from an outbreak; (ii) that the importation is permitted by a general licence granted by the Minister, and that the conditions laid down in the licence have been observed.
Alternative (ii) is not applicable to potatoes; it is, however, extended to produce (except potatoes) from France.
- (c) Flower bulbs, cucumbers and mushrooms are exempted from the requirement in (a) above and this exemption is extended to such produce from France as well as Belgium.
- (d) The requirement in (a) above applies, so far as raw vegetables and cider apples are concerned, only during the period April 21 to October 14 in any year.

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- (e) Certificates of origin for cucumbers and mushrooms will no longer be required where such produce is grown in countries other than France and Belgium.

Copies of the Order (S.R. & O., 1936, No. 313), price 1d. each, post free 1½d., may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

In pursuance of the Order, the Ministry of Agriculture and Fisheries will be prepared to consider applications for general licences for the importation of plants and vegetables (but not potatoes) grown within the specified area surrounding an outbreak of Colorado Beetle. Such applications will, however, be entertained only in respect of a well-defined group or a definite kind of plant or vegetable; they must be supported by evidence to show that, in general, the conditions under which the kind of plant or vegetable is cultivated, and under which it is packed and consigned to this country, are such that the risk of its contamination by the Colorado Beetle is negligible.

Such applications should, wherever possible, be made, not by individual growers or traders, but through representative organizations.

Any licences granted will be for a group or kind of plant or vegetable in general and not in respect of specific consignments or of any particular organization or individual.

Applications for licences which are received before May 1, 1936, will be considered as soon as possible thereafter. Applications received between May 1 and June 30, 1936, will be considered after the latter date. Further notification will be given as to the consideration of applications received after June 30, 1936.

Applications for licences should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Advisory Leaflets

Since the date of the list published in the February, 1936, issue of this JOURNAL (p. 1171), the undermentioned Advisory Leaflets have been issued by the Ministry:—

- | | |
|---------|--|
| No. 22 | Potash Fertilizers (Rewritten). |
| No. 77 | Bird Lice (Revised). |
| No. 104 | Pig Feeding (Revised). |
| No. 152 | The Culture of Green Peas and Beans (Revised). |
| No. 254 | The Tawny Owl and the Little Owl. |
| No. 255 | The Long-eared Owl and the Short-eared Owl. |

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- No. 260 The Buzzard.
- No. 261 Onion and Leek Smut.
- No. 263 Tomato Leaf Mould.
- No. 264 Lavender : Its Cultivation for Marketing and Distilling.
- No. 265 Sclerotinia Disease of Potatoes and other Plants.
- No. 266 Clover Rot.
- No. 267 Potato Growing in Allotments and Small Gardens.
- No. 269 Cabbage Aphis.

Copies of any of the above-mentioned leaflets may be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1*d.* each net (1½*d.* post free), or 9*d.* net per doz. (10*d.* post free).

Single copies of not more than 20 leaflets may, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A list of the Ministry's publications, including leaflets, on agriculture and horticulture may be obtained free and post free on application to the Ministry.

Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report, issued by the Ministry, have been published in pamphlet form (price 3*d.*, post free 3½*d.*):

No. 62 The " Scaldwell " Sterilizer.

The test was conducted at the National Institute for Research in Dairying, Shinfield, near Reading.

Copies of the pamphlet may be obtained, at the price stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

UNCERTIFIED NEW ZEALAND RYE-GRASS SEED

T. J. JENKIN, D.Sc.,

Welsh Plant-Breeding Station, Aberystwyth.

1. Perennial Rye-grass. The evidence available tends to show that, for British conditions, the best Hawke's Bay and Poverty Bay (New Zealand) perennial rye-grass seed is at least as good as the ordinary British-grown (early hay) commercial type. On the other hand, tests have indicated that some so-called perennial rye-grass seed samples from New Zealand produce mainly a poor, rapid-growing but very non-persistent type of plant (Jenkin, 1930).

These two types, and possibly types that are intermediate, have been recognized in New Zealand itself (Levy and Davies, 1929). This has resulted in a system of inspection, registration and certification, so that, in the Dominion, the use of the better-class seed has been greatly encouraged.

The present "certified" New Zealand perennial rye-grass seed has not yet been closely studied by the writer, but, since it is mainly derived from selected Hawke's Bay and Poverty Bay pastures, it should at least not be inferior to unselected lots formerly obtainable from the same areas.

The conditions governing the certification of seed in New Zealand do not appear in any way to prohibit the harvesting or the use of the poorer type in New Zealand, nor do they in any way prohibit the export of such seed. This seed can be grown, harvested and dressed relatively very cheaply, and, in sample, usually appears to be exactly what a good rye-grass sample should be. If imported into this country it might, therefore, easily be accepted as a cheap source of good rye-grass seed.

It must be made quite clear, however, that a range of qualities may possibly be expected. Strict inspection, registration and certification would only accept the best, and there might yet be good consignments that are, of necessity, uncertified.

In the spring of 1934, fourteen samples of uncertified New Zealand perennial rye-grass, each taken from a different consignment imported into this country, were received at

UNCERTIFIED NEW ZEALAND RYE-GRASS SEED

Aberystwyth for study. In addition, one other sample, described as New Zealand perennial rye-grass was submitted by a local dealer.

Previous trials of Hawke's Bay and poor South Island, New Zealand, perennial rye-grass samples have shown that the conclusions drawn from single-plant studies with regard to the relative merits of the two types, are borne out by sward studies.* The former method is much the less laborious, and was therefore adopted for the present samples. For purposes of comparison, one British indigenous, one ordinary British commercial and six special lots of New Zealand seeds obtained from Mr. Bruce Levy, Agrostologist, Plant Research Station, Palmerston North, New Zealand, were used.

Sixty-four seeds taken at random from each lot were planted in sterile soil under greenhouse conditions, April 20 to 23, 1934. When germination was complete, the seedlings were reduced to forty-five per box. These seedlings were planted out in the field on June 15, 1934, each lot forming a block of three rows of fifteen spaced plants. The check lots were arranged to occur in every third position with one uncertified New Zealand lot on the outside.

The plants settled down well, but, owing to drought, growth in all lots was relatively slow in the seedling year. Detailed observations on August 8, showed that no inflorescences had emerged in the British indigenous lot, while one plant out of forty-five in the British commercial lot had produced inflorescences. In the lots representing seed received from Mr. Bruce Levy (which may be referred to briefly as "standard N.Z."), the number of plants per lot that had reached the inflorescence stage on this date ranged from five to ten, with an average of 7.7. The corresponding figures for uncertified New Zealand were: range = 0 to 6; average = 2.7.

This difference was also noticeable later in the autumn, so that the relative behaviour of the standard New Zealand and the uncertified New Zealand was not similar to that of the better and poorer New Zealand types previously studied (Jenkin, 1930). In the latter case, the poor type New Zealand showed a strong tendency to rush into inflorescence and to become exhausted in the seedling year, while the present uncertified New Zealand showed no such tendency. The probable explanation is that, in the present instance,

* I am indebted to my colleague, Mr. William Davies, M.Sc., for information on this point.

UNCERTIFIED NEW ZEALAND RYE-GRASS SEED

development was adversely affected by (1) late sowing, and (2) drought conditions.

All the lots wintered well, and very few plants were actually lost. Spring and early summer growth was also good in 1935, and during this period the main difference between the uncertified New Zealand lots on the one hand, and the ordinary British commercial with the standard New Zealand on the other, was a softer appearance, with, on the average, a broader leaf blade, in the former group.

Observations on the date of the emergence of the tips of the earliest inflorescences through the sheath in each plant, showed that the British indigenous was so much later than the others that it could not, from the present point of view, be effectively used as a standard of comparison. In this lot, in two plants only out of forty-five were the inflorescences showing by May 15, while, in the British commercial and the standard New Zealand lots, the inflorescences were showing in 97 per cent. of the plants. The uncertified New Zealand were on the average somewhat later, with 60 per cent. on the same date.

This difference in the two main groups appeared to be slightly reflected in the condition of the lots when detailed observations were again made on June 26. By this date, all the lots (except British indigenous) were practically devoid of green leaf, but some of the plants in the uncertified New Zealand lots were still somewhat more sappy than the standard lots.

No weight determinations of productivity were made, but each uncertified New Zealand lot was compared by observation with the nearest check lot. On the whole, the latter were undoubtedly superior, but this superiority was not evident throughout when individual lots were under observation, and four uncertified New Zealand lots bearing the station numbers 2534, 2535, 2536 and 2539 compared quite well with the check lots, although one of the standard New Zealand lots concerned, 2499, was quite exceptionally bulky. Lots 2534, 2535, 2536 and the check lot 2499 were greatly favoured by position.

Up to this point, therefore, under the conditions of the experiment, the lots from uncertified New Zealand seed were not greatly inferior to ordinary British commercial or even to standard New Zealand lots.

All the lots were cut hard back on July 4. The uncertified

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New Zealand lots were somewhat later maturing than the main check lots, and would, to that extent, be less exhausted by seed-formation at the time of cutting back. They therefore held whatever advantage that may have existed for the purpose of vegetative regeneration. Yet, it soon became evident that a rather high proportion of the plants in the uncertified New Zealand lots was absolutely incapable of producing an aftermath growth. Detailed observations made on August 18 showed that, in this respect, the difference in favour of the check lots was particularly obvious. In the latter, the losses amounted to less than 2 per cent. on the average, while the general condition of the lots was excellent. Even in the best uncertified New Zealand lot, on the other hand, the effective loss of plants was quite considerable, the lowest figure, as shown below, being 27 per cent. in lot 2533. In most of these lots, however, plants of approximately the same general type as the standard New Zealand occurred in small but varying proportions. In addition, there were plants that did show varying degrees of vegetative regeneration of a truly vegetating type. These graded from practically dead to fair vigour when they would rank as poor standard New Zealand types. In a third type of plant, there were again varying grades (usually very low) of regeneration, but the aftermath consisted, almost without exception, of weak flowering stems with no non-flowering tillers at the base. From a persistency point of view, these were obviously useless, and they, together with the plants that had died without making any attempt whatsoever at vegetative regeneration, may be regarded as having been effectively lost. In fact, a proportion of the plants regarded as forming the second class should also be regarded as effectively lost; but, since here there was considerable grading from plants that might compare favourably with poor standard New Zealand down to those that were only nominally alive, a subclassification could not be made. The table given below, showing the percentage of plants effectively lost in each of the uncertified New Zealand lots, therefore flatters the group as a whole.

It should again be emphasized that these figures for the uncertified New Zealand lots do not represent the actual loss in aftermath productivity as compared with the check lots, since the average vigour of those plants that have not here been classified as effectively lost was far below that of the check lots.

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TABLE SHOWING THE EFFECTIVE LOSS OF PLANTS AFTER CUTTING BACK ON JULY 4, IN THE FIRST HARVEST YEAR, BASED UPON OBSERVATIONS MADE AUGUST 18, 1935.

<i>Description.</i>	<i>Station number of lot.</i>	<i>Percentage of plants effectively lost.</i>
Uncertified	2524	82
"	2525	71
"	2526	47
"	2527	64
"	2528	87
"	2529	78
"	2530	31
"	2533	27
"	2534	31
"	2535	53
"	2536	98
"	2537	96
"	2538	76
"	2539	35
"	2542	100
"	Average	65
" Standard " N.Z. and other check lots	—	Average less than 2 per cent. loss

At this point, it is interesting to note what has happened to the four uncertified lots that compared favourably with the standard lots before they were all cut back on July 4. These four lots were 2534, 2535, 2536 and 2539. It will be noticed that 2536 has gone down very badly, while 2534 and 2539 are still amongst the best. In fact, however, 2534 has been considerably favoured by the method of scoring, so that despite the figures, it did not really compare well with 2539. It is therefore evident that apparent vigour up to the hay-cutting point, and bulk of hay in the first harvest year, are no safe criteria of ultimate value where persistence is an important consideration.

From an agricultural point of view, the best four lots now appeared to be 2530, 2533, 2534 and 2539, but when these again were compared in greater detail, it was found that the average for those plants not effectively lost in 2539 was quite distinctly better than for the others.

All the lots were again observed in some detail on September 23, 1935. Of the uncertified New Zealand, 2530, 2534 and 2539 now showed the highest proportion of more or less living plants, but a high proportion in 2534 was very excessively stemmy, and the lot, as a whole, was inferior to

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2530, in which even the best plants were not considered to be up to the average of the standard New Zealand. Even in 2539, a very considerable proportion of the plants had failed absolutely after cutting back, but the lot, as a whole, was decidedly better than the average for uncertified New Zealand, and a few of the best plants were nearly as good as the best of the nearest standard New Zealand lot.

Observations were finally made on November 21, 1935, when no material changes in the relative positions of the different lots were found to have taken place. A few of the weakest plants had actually died, but most of the plants, even very excessively stemmy and weak ones, had so far survived, but showed no access of vigour.

Reviewing the whole experiment, it is evident that while the uncertified New Zealand seeds, under the conditions prevailing, gave plants that showed no great inferiority to those from standard (which may probably be regarded as roughly representing certified) New Zealand seeds up to and including the hay crop of the first harvest year, although, on the aggregate, this inferiority even at this point was definite.

The enormous difference between the two groups of plants, however, at once became evident in the aftermath. The lots from uncertified seed certainly differed greatly one from another, but not one of them compared at all favourably with the nearest check lot, while, at their worst, these lots showed effectively a complete loss after the first hay crop. Of the fifteen lots tested, only one, lot 2539, could be regarded as being of sustained agricultural value; this lot might conceivably, provided the seeding were heavy, have given satisfactory results.

It is possible that some other lots might be capable of yielding more or less satisfactory results in the hay crop of a one-year ley, but the capacity to survive up to the first hay crop might be a definite danger were the seed used for a ley of longer duration. The competitive and shading effect of the rye-grass would be injurious to the less rapid growing but more persistent types and species, so that when the rye-grass failed after the first hay crop an exceptionally high proportion of bare ground would be left, ready to be colonized immediately by inferior plant species.

The possibility that one, or a few of the samples in the fifteen may represent a comparatively useful type is certainly not sufficient to justify the use of uncertified New Zealand

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perennial rye-grass seed in this country. In fact, the free admission of seed of this type into the country cannot be contemplated without serious apprehension. The gravity of the situation will be realized more effectively when it is pointed out that lot 2542, the least satisfactory of the fifteen tested, represented seed obtained from a dealer operating in remote districts in Cardiganshire, where practically every field that is at any time cultivated is periodically laid down to long duration leys, and where the chances of perpetuation by seed are non-existent as far as perennial rye-grass is concerned.

II. Italian Rye-grass. It will not be out of place, perhaps, to conclude this article with a short note on the behaviour of New Zealand Italian rye-grass.

In 1934, fourteen samples, representing a similar number of consignments imported into this country, were received at Aberystwyth, and an additional lot described as New Zealand Italian was obtained locally.

These were dealt with in exactly the same way as the perennial rye-grass lots, but only three check lots were included. These three consisted of the Welsh Plant Breeding Station strain S.22, and two British commercial lots, and single lots of each were regarded as the standard for comparison.

The position with regard to New Zealand Italian is entirely different from that in New Zealand perennial rye-grass, since no claim to superiority has ever been advanced on behalf of the New Zealand Italian, and lots, previously tested at the Welsh Plant Breeding Station, have been found consistently to be of inferior value.

The present lots proved to be no exception, but there was a considerable degree of variation from one lot to another. Some of the lots consisted mainly of "perennial" rye-grass of a similar type to the poorest of the uncertified lots already described. Some others were mainly or entirely true Italian, but few of them came anywhere near the check lots in average vigour, and, in fact, even the best plants amongst them were relatively poor. In general, despite the fact that the seeds were planted relatively late, a very high proportion of the plants became almost completely exhausted in the seedling year, so that they made an exceedingly poor show in the first harvest year.

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It is possible that, sown in the usual way, their development in the seedling year might have been retarded by the nurse crop. Even the best lots, however, are inferior in type and in vigour to the ordinary British commercial, and it is clearly evident that the British farmer stands to lose rather than to gain by using the present type of New Zealand Italian rye-grass seed available on the market.

It is only fair to add, however, that attempts are now being made at Palmerston North to produce improved strains of Italian rye-grass, and that, for this purpose, the best European material is being explored.

Acknowledgment.—Thanks are due to Mr. L. E. Cook for kindly supplying me with the samples of uncertified seed.

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DISEASES OF OUTDOOR-GROWN TOMATOES IN JERSEY

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ABOUT 1,800 to 2,000 acres are planted with outdoor tomatoes every year in Jersey, the two chief varieties being *Sunrise* and *Devon's Surprise*. What is known as the first crop is planted in the field early in May, while the second crop is planted late in May or early in June, after the early potatoes have been harvested. It is quite usual to see potatoes lifted one day and the same field planted with tomatoes the next day. The plants are "stopped" at the fourth truss and the average yield is $1\frac{1}{2}$ lb. to 2 lb. per plant, the first crop giving the higher yield. For the first crop a mixture of artificial fertilizers containing 3.5 per cent. nitrogen, 9 per cent. potash (K_2O), and 8 to 10 per cent. phosphoric acid (P_2O_5), is used at the rate of 10 cwt. per acre, while the second crop draws upon the manurial residues left by the early potatoes. Top dressings are applied as required during the season.

Picking begins during the third or fourth week in August, but the bulk of the produce is exported in September when the supply of English tomatoes is rapidly decreasing. In fine seasons picking may continue until early November.

Blight (*Phytophthora infestans* (Mont.) de Bary). This disease, which is due to the same fungus as that which causes Potato Blight, occurs every year and is the most serious malady affecting outdoor tomatoes in Jersey. It attacks the stems, leaves and fruits, and may spread with alarming rapidity in the autumn when the plants are fully grown and when sea fogs and heavy dews frequently occur. Heavy losses are sometimes experienced owing to the disease attacking tomato seedlings in the boxes.

Experience has taught the farmer that spraying is essential to check Blight, and the result is that every grower sprays frequently and thoroughly. In most instances the young plants are sprayed in the seed boxes, and, after planting-out, they are sprayed weekly throughout the season. During foggy weather more frequent sprayings are given. This is

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interesting, since it illustrates how keen the grower is when once he is convinced of the value of a preventive method. Both horse-drawn and knapsack machines are used. Some farmers prefer wet sprays, others dry applications, but during the past few years the latter have become more popular. A home-made wet spray, neutral to litmus, consisting of 4 lb. copper sulphate and about $1\frac{1}{2}$ lb. caustic soda in 40 gal. of water, is widely used. The only objection to this spray and to many of the proprietary wet sprays, is that they leave a deposit on the fruit which has to be cleaned off before export. This difficulty is obviated by using such proprietary sprays as Eau Celeste and L'Eclair late in the season when the fruit is swelling on the plants.

It may be noted here that all proprietary sprays in the Island are examined periodically for metallic copper content, excess or deficiency of alkalinity, kind of precipitate, etc., and the sprays that are neutral to litmus or have a little soluble copper present and form a flocculent precipitate are preferred to those having excess alkali and forming a heavy granular precipitate. This examination has had the effect of improving the standard of sprays on sale in the Island. "Dry sprays" with 16 per cent. metallic copper content are used most; a few growers use those with 20 per cent. metallic copper content, but scorching occurs under certain conditions.

The problem as to whether the Blight fungus from the potato can infect the tomato and *vice versa* has been studied, since both crops are often grown in the same field. In the space available, it is not possible to give full details of the experiments conducted over the past four years, but the following facts are recorded:

- (a) The blight fungus taken from tomato plants and fruits readily infects potato plants.
- (b) The blight fungus taken from tomato plants and fruits and used to infect potato leaves will pass readily from such infected potato leaves back to the tomato plant.
- (c) The blight fungus taken from late potatoes growing alongside diseased tomatoes in the open in autumn passes readily to the tomato plant. (It should be noted here that this potato blight may have come from the diseased tomatoes, *see* (a) above).
- (d) The blight fungus taken from the early potato crop in the open in spring, when there are no tomatoes out of doors, and no blight other than that on potatoes, often fails to infect tomato plants. Many experiments were made and in only two instances was successful infection established on tomatoes, although under the same conditions potato leaves became severely infected. When infection did occur on tomatoes the diseased areas were small and

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unlike those that developed under (b) and (c) above. It is clear that the blight fungus taken from potatoes in spring will not pass readily to tomatoes. This conclusion was supported in field trials where tomatoes and potatoes were interplanted in spring; the latter were killed by Blight while the former remained practically healthy.

Stem Rot (*Didymella Lycopersici* Kleb.). This disease ranks second in importance to Blight on tomatoes in Jersey. It is often mistaken for Blight by growers, but, unlike Blight, the severity of which is closely related to seasonal atmospheric conditions, Stem Rot occurs fairly regularly every year. It is not so widespread as Blight nor does it spread so rapidly, but it causes serious losses and is perhaps more difficult to control. The disease declares itself at a critical period when the plants are fully grown and have three or four trusses of swelling and ripening fruit. In most cases the plant is rapidly killed at this stage and little or no fruit is harvested. On three experimental plots, each containing 300 plants, the numbers killed by Stem Rot in 1934 were 110, 137 and 152 respectively. Besides killing the plants outright the disease attacks the fruit of otherwise healthy plants, and although infection may take place at any part of the tomato it occurs most frequently at the stem-end, underneath the calyx, and causes the fruit to fall from the plant. Such infected fruits may be found in almost all tomato fields in the Island. The fungus penetrates into the tomato and all affected tissues turn black and numerous spore-containing pycnidia are produced. The disease on the stem may appear at ground level or higher up, especially at the nodes where large dark-brown areas and cracks develop; and this explains why the disease used to be called "canker." Such cracks do not occur when Blight attacks the stem. The pith and vascular tissues become discoloured for a considerable distance from the point of infection. Often the disease starts in the leaf and works back along the main leaf-stalk into the stem. It is worthy of note that pycnidia of a fungus apparently identical with those of *Didymella Lycopersici*, found on tomatoes, have been very plentiful on the stems of Kerr's Pink potato, at the end of the season. Cross inoculation experiments showed that the fungus on these stems was parasitic on tomato stems and fruits.

It is possible that Stem Rot would be more prevalent in the absence of spraying, but observations show that the sprays themselves and the method of their application as used to

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control Blight, are not sufficiently effective against Stem Rot. The latter disease causes loss on crops which have been kept free from Blight by spraying. Soil sterilization, as a means of checking the disease, is too expensive for outdoor culture. The following precautions are suggested to reduce the disease. To prevent the possibility of seed transmission, seed should be saved from healthy fruit only. The remains of diseased plants or fruits should not be dug in the soil and the bamboo supporting canes should be treated with formaldehyde, as described later under Wilt disease. Infected leaves must be removed before the attack passes to the stem; affected parts of the stem may be pared off before the disease penetrates too deeply, and the wound painted with Bordeaux paste. Instead of using water to moisten the soil in the seed boxes before planting-out, it is better to use a fungicide; it is important to spray the "leg" of the plant and the soil around it at intervals during the season.

Damping-off and Foot Rot. Damping-off in the seed boxes is caused by certain species of *Phytophthora* and by *Corticium Solani* Bourd. and Galz.; Foot Rot, caused by the latter fungus, occurs after the seedlings have been planted in the field. *Corticium Solani* is very prevalent in the soil in Jersey and also on seed potatoes, but it is not very harmful to the potato crop. It is more destructive to young tomato plants, especially if they are planted after potatoes in cool, moist weather.

Owing to the introduction of soil sterilization, both diseases are less serious in the seed-box stage than formerly. Many farmers have built ovens for baking their soil, but most of the ovens are rather crude and inefficient. The mistake made by most growers is that the soil is too dry when baked, and this causes it to become markedly alkaline. Under these conditions the seeds germinate normally, but after they are pricked-off the plants develop a dark, unhealthy green colour and growth is irregular and stunted. When watered with commercial sulphuric acid (one part per thousand by volume of 77 per cent. acid) boxes of pricked-off plants recovered partially but quickly. The addition of peat to a heap of such alkaline propagating soil improves the growth.

During recent years steam sterilization has been introduced into the Island and is rapidly gaining favour with the growers. It is more efficient and less expensive than the ovens previously used.



FIG. 1.—Stem Rot : next to Blight, the most serious disease of outdoor-grown tomatoes in Jersey.



Photos : Dr. T. Small.

FIG. 2.—Root Knot, a disease occurring frequently in outdoor-grown tomatoes in Jersey.

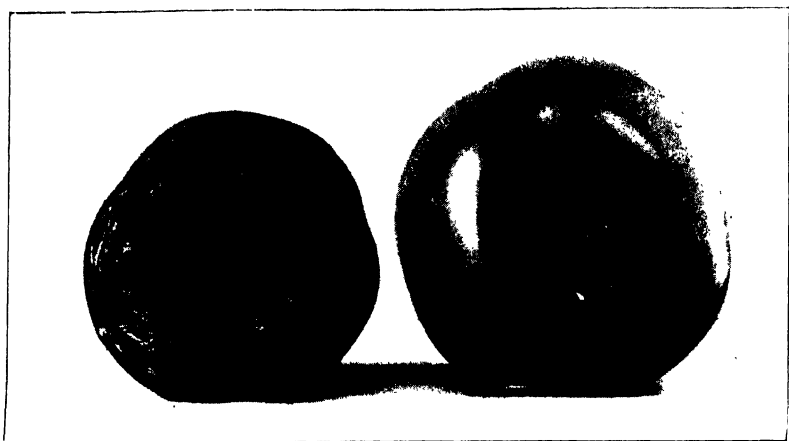


FIG. 3.—Tomato fruit attacked by *Didymella Lycopersici*, Kleb.



FIG. 4.—Foot Rot of tomato.



Photos: Dr. T. Small.
FIG. 5.—Leaf Mould of tomato

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As a precaution against Foot Rot in the field, the boxes of seedlings are dipped in a fungicide instead of in water immediately before planting out. The disease is most prevalent under conditions which check the growth of the young plants. By planting in warm soil under favourable weather conditions less Foot Rot occurs.

Leaf Mould (*Cladosporium fulvum* Cooke). Usually, this disease is serious only on glasshouse tomatoes. In Jersey it is present on the outdoor crop every year, but not to a degree sufficient to cause damage except in sheltered, low-lying, moist areas. Here the leaves become covered with Leaf Mould and the plants die prematurely in spite of frequent applications of Bordeaux or Burgundy mixtures. Experiments are in progress in which Burgundy mixture, which is used to control Blight (*Phytophthora infestans*), is replaced by a spray consisting of Eau Celeste and Agral 1, when Leaf Mould appears. This spray checks both diseases but is more expensive.

Although Leaf Mould is not usually serious on open-air crops, its presence is a danger to the early glasshouse crop as shown by the following experience. On January 19, 1932, the writer inspected a large nursery and found that almost every plant was attacked by Leaf Mould. The glasshouses had been planted on January 10, and it was evident from the advanced state of the disease that infection had occurred in the propagating house. In Jersey propagation is carried out in November and December. Inquiries showed that in November the workmen were engaged in clearing the old tomato crop in the open, and, at intervals, the same men were employed in the propagating house. It seemed likely that the young plants had become infected by spores carried on the hands of the workmen. It was suggested that the men should wash their hands in weak lysol and put on clean overalls before entering the propagating house. This has been carried out during the past three seasons and no Leaf Mould has appeared on the young glasshouse plants.

Verticillium Wilt (*Verticillium albo-atrum* Reinke and Berth.). This disease, fairly prevalent at one time, is now rarely met. It was observed that far less Wilt occurred when string or new bamboo canes were used to support the plants. This led to the idea of soaking the old canes in 2 per cent. formaldehyde (1 pint of 40 per cent. formaldehyde in 49

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pints of water) for 15 minutes and covering them for 48 hours. This reduced the amount of Wilt and is now a routine practice on most farms. New canes, string and old canes (treated and untreated), have been tested on plots in the same field and most Wilt occurred where old, untreated canes were used.

Root Knot (*Heterodera marioni* Cornu). This disease is not caused by a fungus but is interpolated here because it occurs frequently on open-air tomatoes in Jersey. In some instances the plants tolerate the pest and produce three or four good trusses of fruit, but in others they remain stunted and bear little or no fruit. Attempts to control the disease in the open have met with no success. Steam sterilization is too expensive and crop rotation is rarely possible. In 1934 whizzed naphthalene, calcium cyanamide and paradichlorbenzene used at the rate of 10 oz., 9 oz. and 2½ oz. per sq. yd. respectively, were tested on small plots of 32 sq. yd. each. They were applied on April 19, after ploughing, and were harrowed in; rain fell later in the day. The plots were planted on May 9, but the plants failed to grow except where paradichlorbenzene was used. On June 12, the naphthalene and calcium cyanamide plots were replanted, but most of the plants failed to grow on the latter plot; on this date the soil smelt strongly of naphthalene. The roots of the plants on the naphthalene and paradichlorbenzene plots were examined early in October and every one was found to be severely attacked with Root Knot, despite the exceptionally heavy doses of the chemicals used. In view of the lack of control methods for this pest in the open, every care should be taken to prevent it from spreading to other fields. Soil taken from an infected area and used for propagating purposes will convey the pest to glasshouses and other fields unless it is properly sterilized. Infected roots should be burnt and should not be thrown on the manure heap.

Grey Mould (*Botrytis cinerea* Pers.) This disease is always present but is seldom serious except in wet seasons. Sometimes it kills the plant by attacking the stem, but the chief damage results from infection of the fruit at the stem end, where a watery rot develops and the fruit falls from the plant. In a case inspected in 1935, 20 per cent. of the tomatoes were affected in this manner. The fungus is a wound parasite, and crops grown in the open are very subject to infection because high winds break off parts of the plant

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and cause chafing where the supporting string touches the stem. In addition, the crop does not receive as much attention as an indoor one. Side shoots often grow too long before they are removed, and removal leaves a large wound which does not heal quickly.

Where Grey Mould is troublesome the following precautions will help to reduce the disease:—The side shoots should be removed early, thus leaving a small clean wound that will soon heal. Diseased areas on the stem may be pared out and the wound painted with Bordeaux paste as described under Stem Rot disease. Leaves that are dying should be removed, as they are likely to be attacked and spread the disease. The variety *Sunrise* appears to be less susceptible than *Devon's Surprise*. The latter is a flatter fruit and at the stem end has furrows in which dew and rain remain and encourage the fungus. In bad cases the trusses have been sprayed with calcium bisulphite (S.G.1068), 1 gal. in 150 of water, but no critical tests have been carried out. Stronger solutions are apt to mark the fruit.

OTHER DISEASES: PHYSIOLOGICAL DISORDERS

Blossom-end Rot and Green Back cause some loss, especially in dry seasons, but Blotchy Ripening occurs in most years and is rather prevalent, especially on the first truss. The losses may be reduced by applying bulky organic manures to increase the water-holding capacity of the soil, by supplying suitable top dressings containing nitrogen and potash in showery weather, and by cultural operations which assist the plant to produce a well developed, healthy root-system.

Leaf Spot (*Septoria Lycopersici* Speg.) This is one of the most serious diseases of outdoor tomatoes in the United States, and it is prevalent also in Australia. In England it is uncommon, having been reported only in 1908 and 1926. An outbreak occurred over a $\frac{1}{2}$ acre field of tomatoes in Jersey in July, 1934. Leaf Spot attacks the lower foliage first and passes up the plant to the younger leaves. The diseased spots are oval to circular, sunken, brittle, pale brown with a darker margin, and contain numerous black pycnidia. Affected leaves die and fall to the ground, and in a severe

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attack all that is left is a tuft of young foliage at the top of the plant. This defoliation results in small fruit that ripens prematurely. It is possible that this disease and Target Spot (see below) would be more prevalent but for the frequent spraying carried out by growers in the Island.

Target Spot Disease (*Macrosporium Solani* E. and M.) This disease attacks the young foliage, producing circular brown spots, $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, with concentric markings that give a target-like effect. Very few of the very long club-shaped spores were produced on the plant and in pure cultures of the fungus. Inoculation-tests with a spore suspension on tomato leaves were successful. Target Spot occurs in most years in Jersey, but too late in the season to cause damage. It has not been observed on the early potato crop.

Virus Diseases. These do not appear to be important on the outdoor crop in Jersey. Plants with Stripe-like symptoms are observed occasionally, and while one attack of Spotted Wilt has occurred on glasshouse plants no case has been seen in the open.

Sclerotinia Disease (*Sclerotinia sclerotiorum* (Lib.) de Bary.) This disease is serious on outdoor tomatoes in New Zealand, but in Jersey it occurs only occasionally on outdoor and indoor tomatoes and on the early potato crop.

Root Rots caused by *Thielaviopsis basicola* (Berk.) Ferraris, and by *Colletotrichum atramentarium* (Berk. and Br.) Taubenh. also occur, but are not important. This also applies to the fruit rots caused by *Pleospora herbarum* (Pers.) Rabenh., *Alternaria tenuis* Nees and *Fusarium Equiseti* (Cda.) Sacc.

TUBERCULOSIS IN A DAIRY HERD

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As part of their Agricultural Education Scheme, the West Sussex County Council maintain a demonstration farm. The object of the farm is to demonstrate approved practice in methods of cultivation, manuring, crop varieties, management of stock, and the production of milk. The farm extends to 165 acres, of which 100 acres are permanent pasture. The farming interests in the County are varied, and there has ever been a desire to cater for as many of these as possible, with the inevitable result that individual units are small and consequently rather uneconomic. From time to time, the number of activities has been reduced, this resulting in units more in keeping with commercial practice. This article is confined to a description of the experience with tuberculosis in the dairy herd.

The herd was established in 1920 on a foundation of commercial Dairy Shorthorns purchased in the open market as heifers, either freshly calved or near to calving. A pedigree Dairy Shorthorn bull was used, and the best heifer calves were reared. The herd, however, was not self-supporting, and from time to time new animals were purchased. A high standard of cleanliness in milk production was practised, and the milk was sold wholesale. A ready market was found for the milk, but in spite of its admittedly high standard of cleanliness and good keeping quality, it was not possible to get an increased price.

This was the position up to 1927. In that year, it was decided that some attempt should be made to produce a milk of such quality as would command a higher price. With this object in view, it was determined that as soon as practicable, with the least possible effect on the revenue account, the Shorthorn cows should give place to Guernseys, and that steps be taken to comply with such requirements as would enable the Council to sell Grade A (Tuberculin Tested) milk.

The subsequent history of the herd can be divided into two periods:

- (a) between September, 1927 and April, 1931, and
- (b) subsequent to that date down to July, 1935.

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In the first period, the main purpose was to comply with the regulations of the Ministry of Health for the production of Grade A (Tuberculin Tested) milk. During the second period, the main object was to free the farm, section by section, of all tubercular infection and maintain a self-supporting dairy herd.

Tuberculin testing was commenced in September, 1927. At that date, the cattle on the farm consisted of 27 cows in-calf or in-milk, 4 barren cows, 15 in-calf heifers, 20 one-year-old heifers, 24 heifer calves, 2 bulls and 15 fattening bullocks. There was ample accommodation for segregating the dairy herd, and only the cows and heifers actually in the milking herd were subjected to the test. Reactors were segregated until such time as they could be disposed of for slaughter, and all purchased animals and home-bred heifers were tested before being admitted to the milking herd. The double intradermal tuberculin test was used throughout, with tuberculin approved by the Ministry of Health. The testing was done by local practitioners up to February, 1933, and since that time by L. Jordan, Ph.D., Chief Veterinary Officer for the County. At the initial tests, the assistance of Professor Buxton was obtained, and he conducted a check test on the animals which had been rejected by the local veterinary surgeon. Table I will enable readers to see at a glance the results of the tests made up to April 1931:—

TABLE I.

<i>Period.</i>	<i>Cows added to the herd.</i>		<i>Number</i>	<i>Number</i>	<i>Number</i>
	<i>Home-bred.</i>	<i>Purchased.</i>	<i>Tested.</i>	<i>Passed.</i>	<i>Failed.</i>
5/9/27	8	18	26	19	7
6/9/27-30/10/27	1	11	12	12	0
31/10/27. 6/3/28	2	6	34	32	2
7/3/28. 11/9/28	6	9	47	47	0
12/9/28. 5/3/29	0	0	43	41	2
6/3/29. 16/9/29	8	4	50	50	0
17/9/29. 22/3/30	0	0	43	42	1
23/3/30. 7/10/30	0	0	39	39	0
8/10/30. 10/4/31	3	1	41	3	38

The initial test was completed on September 5, 1927, and 26 cows, only 8 of which were home-bred, were tested. 7 animals failed to pass the test. Having regard to the way the herd had been built up, it was regarded as satisfactory to get 73 per cent. to pass the test. The reactors were at different stages of lactation, nearly all were again in-calf, and they were segregated until such time as they could be conveniently

TUBERCULOSIS IN A DAIRY HERD

sold for slaughter. This procedure allowed observations to be made as to their subsequent health and thriving capacity. One animal developed Johne's disease and was disposed of within a year, but all the other animals were fattened and sold for slaughter at periods varying up to 17 months after they failed to pass the test. Table II sets out the method of disposal of the original reactors.

TABLE II.

<i>Herd No.</i>	<i>Year of birth.</i>	<i>Date purchased.</i>	<i>When sold.</i>	<i>Condition.</i>
1	1917	26/9/19	10/8/28	Fat
41	1919	28/5/22	27/2/29	Fat
59	1919	3/4/24	27/2/29	Fat
64	1921	Home-bred	27/2/29	Fat
68	1921	28/10/25	18/7/28	Fat
76	1923	5/4/26	7/11/28	Fat
79	1923	5/4/26	10/8/28	Johne's Disease

Within six weeks of the initial test, 12 heifers were added to the herd; 1 was home-bred and 11 were purchased in the open market; all passed the test before being admitted.

The remaining periods can be conveniently discussed in six-monthly stages as set out in the table. In the period ending March 6, 1932, 2 reactors were found—Nos. 29 and 87. No. 29 was purchased in 1920 and was 11 years of age when she reacted; she was subsequently sold in fat condition on February 27, 1929, nearly a year after the test. No. 87 was 4 years old and was purchased in September, 1927, and passed the test at that time; this animal was sold on May 8, 1929, and was in good fat condition.

In the following six-monthly test no reactors were found, but, in March, 1929, No. 83 and 108 both reacted. No. 83 was home-bred and was subsequently sold fat on May 8, 1929; No. 108 was purchased on October 12, 1927, but did not come into the tested herd until June, 1928. After March, 1929, this animal broke down rapidly and was finally disposed of under the Tuberculosis Order on May 28, 1929, within 12 weeks of the time when she reacted. No further reactor was found until March 22, 1930, when No. 89 reacted; this cow was purchased on September 14, 1927, and had passed 5 tests successfully. She was six years of age when she reacted, and was sold in fat condition 4 months later.

The usual six-monthly test in October, 1930, gave a very satisfactory result and every animal passed.

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The test completed on April 10, 1931 was an almost complete reversal of the experience during the previous 3½ years. Only 3 animals passed the test and these included 2 heifers that had been in the herd for only 2 months. The only other animal to pass the test was a purchased animal that entered the herd on September 11, 1928. It would be conjecture to attempt to explain such a complete breakdown. At first, it might be doubted whether the tuberculin tests were efficiently applied and interpreted; this opinion was supported by the fact that this particular test was carried out by a different veterinary surgeon under the supervision of Mr. Glover of Cambridge and with tuberculin prepared at Cambridge. The subsequent history of the herd, however, tends to indicate that a particularly virulent type of infection prevailed after April, 1931.

During the previous 3½ years only one animal that reacted to the test, developed clinical signs of infection and this was No. 108, which was disposed of under the Tuberculosis Order, on May 28, 1929, within 12 weeks of the time when she reacted, and was then certified as "advanced."

Subsequent to the test in April, 1931, breakdowns were frequent; and, within 6 months, 3 animals were taken under the Tuberculosis Order and 2 of these were certified as advanced; 2 more followed at 12 months and, up to November, 1934, when the reacting cows were finally disposed of, no fewer than 11 of the original 38 reactors were disposed of under the Tuberculosis Order, being, with one exception, advanced cases.

Had this experience occurred in the early days, when frequent buying of new animals was practised, blame might have been given to such a source, but, in the two years previous to April, 1931, only one purchased animal was introduced; this animal was purchased on December 3, 1930, and, after passing the test, entered the herd. This animal was one of the 38 reactors in April, 1931, and, later in the summer, became unthrifty and was disposed of under the Tuberculosis Order on August 24, 1931; on post mortem examination it was declared as not advanced, the only organ affected being the womb.

The subsequent history of the individual cows that reacted on April 30, 1931, is set out in Table III.

Two cows, Nos. 81 and 107, were slaughtered and subjected to post mortem examination to verify the result of the test.

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TABLE III.

<i>Herd No.</i>	<i>Year of birth.</i>	<i>Date purchased.</i>	<i>When sold.</i>	<i>Condition.</i>
17	1918	25/2/20	29/6/32	Fat
51	1920	Home-bred	14/6/33	Fat
69	1923	Home-bred	29/6/32	Fat
78	1923	5/4/26	14/11/34	Fat
80	1923	5/4/26	29/6/32	Fat
81	1923	5/4/26	.5/31	(See text)
82	1923	5/4/26	20/7/32	Tuberculosis Order
84	1924	Home-bred	11/11/32	Tuberculosis Order
86	1924	14/9/27	14/6/33	Fat
88	1924	14/9/27	31/10/34	Fat
90	1924	14/9/27	31/5/34	Healthy*
92	1924	14/9/27	15/2/34	Tuberculosis Order
94	1924	26/9/27	24/1/34	Tuberculosis Order
95	1925	Home-bred	14/11/34	Fat
96	1924	9/11/27	20/1/34	Fat
98	1925	Home-bred	24/8/31	Tuberculosis Order
99	1925	27/4/27	14/11/34	Fat
104	1925	25/4/28	15/10/31	Tuberculosis Order
107	1925	12/10/27	.5/31	(See text)
111	1924	Home-bred	11/1/33	Fat
112	1926	27/4/27	31/5/34	Healthy*
113	1925	Home-bred	31/5/34	Healthy*
114	1926	Home-bred	16/11/34	Tuberculosis Order
115	1925	Home-bred	19/4/32	Tuberculosis Order
116	1924	10/10/26	11/1/33	Fat
118	1926	27/4/27	18/1/32	Fat
120	1926	Home-bred	23/6/33	Tuberculosis Order
122	1926	Home-bred	19/4/32	Tuberculosis Order
123	1926	Home-bred	29/11/33	Fat
124	1925	Home-bred	31/5/34	Healthy*
125	1927	24/4/29	10/9/34	Slaughtered
126	1927	24/4/29	17/5/33	Fat
128	1927	Home-bred	31/5/34	Healthy*
130	1927	Home-bred	20/1/34	Fat
131	1927	Home-bred	31/5/34	Healthy*
132	1928	Home-bred	26/10/32	Died
133	1927	3/12/30	24/8/31	Tuberculosis Order
136	1927	Home-bred	31/10/34	Fat

* Animals disposed of on 31/5/34 were all in good health and were sold to the Ministry of Agriculture for experimental purposes.

In one case, tubercular lesions were found; and, in the other the suspicions formed on post mortem were confirmed by biological tests.

There was no option but to surrender the Grade A (Tuberculin Tested) Licence and to revert to ordinary milk production. Such a high proportion of reactors raised fears as to the safety of the milk. A careful watch was kept and repeated biological tests were made of the milk to ensure reasonable freedom from infection. The herd was continued 3 years after the date of the breakdown and only one case

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of udder infection was ever discovered; this animal was disposed of under the Tuberculosis Order before the results of the biological test were known.

The second period commenced under the conditions already revealed; the premises and pastures were now presumably heavily infected and it was not considered practicable to sell immediately all reacting animals. In addition to the dairy herd, there were 33 heifers of all ages on the farm, all of which had been kept separate from the dairy herd, but as the same staff was employed to attend to them, they could not be considered as isolated from infection. Bullock fattening was also carried on and heifers and bullocks were grazed in adjoining fields. Eventually it was decided to make an attempt to build up a tubercle-free herd with home-bred stock and limit the purchases to Guernsey calves imported direct from Guernsey. All other purchases of stock, including bullocks, were stopped; the farm was double fenced on all its boundaries and testing was commenced on the heifers of all ages to 5 or 6 months old.

A test of the young stock was made in August, 1931. Three groups of heifers were then available. Group 1 consisted of 10 heifers varying in age from 23 to 42 months. This was a particularly unfortunate group, as, before the date of testing, 5 of them had calved prematurely. Fortunately the abortion trouble was confined to this group of heifers, and did not spread to any of the other cattle on the farm. When tested for tuberculosis, 9 of the animals reacted, the only free animal being the youngest heifer, then 23 months old. Group 2 consisted of 11 heifers varying in age from 12 to 21 months; 2 animals in this group reacted to the test, their ages being 15 and 21 months respectively. Group 3 consisted of 9 heifers varying in age from 5 to 13 months; one animal, a calf 7 months old, reacted. There was thus a nucleus of 19 animals on which to attempt to build a new herd. These were segregated as far as practicable, and it is noteworthy that none of these animals ever reacted to subsequent tests. It was apparent that no serious infection existed in the rearing quarters, and, although the whole of the breeding herd at this time consisted of reactors, the practice of rearing the calves from reacting cows was continued. About this time, a part of the farm was sold and with it a set of buildings. To replace the buildings that had been sold a new cowshed with accommodation for 26 cows was erected, but this was not

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ready until January, 1933. Meanwhile, every effort was made to keep the non-reactors free from infection. In order to clear up pastures the practice was to allow 5 to 6 months rest after reacting stock had used it. As the number of stock on the farm kept on increasing, advantage was taken of an old Lucerne ley on the arable land on which no stock had grazed for years. In this way, it was possible to rest infected fields in turn until, in January, 1933, more than half the grass land was carrying only non-reacting stock.

Before the new stalls were ready, a number of the non-reacting heifers were in milk and grazed the old Lucerne ley. They used a cow-stall set apart for them after it had been thoroughly disinfected, but had, however, to walk over about 80 yards of the roadway used by the reacting herd and were attended by the same staff. No case of infection arose as a result of this procedure, and no reaction was found between August, 1931 and January, 1933.

Regular routine testing was commenced in January, 1933, and a Grade A (Tuberculin Tested) Licence again obtained. The results of the tests made between January, 1933, and July, 1935, are set out in Table IV.

TABLE IV.

<i>Date Test completed.</i>	<i>No. of animals tested.</i>	<i>No. Negative Reaction.</i>	<i>No. Positive Reaction.</i>
26/1/33	51	47	4
27/4/33	28	25	3
21/7/33	48	47	1
2/2/34	67	66	1
17/4/34	32	27	5
20/7/34	74	72	2
30/1/35	84	84	0
12/4/35	14	14	0
18/7/35	100	99	1

The test completed on January 26, 1933, included 13 heifers in milk, 12 heifers in-calf, and 26 heifers ranging in age from 5 to 20 months. With the exception of 5 pedigree Guernsey heifers, which had been purchased as calves from Tuberculin Tested herds, all the animals tested were bred on the farm and the dams of 44 of them were reacting cows, and 21 of these were born after a reaction was recorded. The failures at this test were all young heifers. All possible contacts with these reactors were retested on April 27, 1933, and, in addition, 4 young calves were tested for the first time. 3 reactors were found, including 1 of the calves tested for the

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first time. It was possible to trace contacts between these and the former reactors, although at each test when reactors were found, all the buildings where the reactors had been housed were subjected to thorough disinfection.

On July 21, 1933, the whole of the tested herd was again tested, and this time only 1 reactor was found; this animal was a contact with some of the earlier reactors. On February 2, 1934, the test again comprised the whole of the tested herd. 1 reactor was found, a calf 5 months old, out of a reacting cow. It is evident, from subsequent experience, that this animal was associated with a fresh source of infection. In consequence of this one failure, all the heifers between 2 and 18 months were tested on April 17, 1934. 5 reactors were found, consisting of 4 animals which had passed the test on February 2, 1934, and 1 calf tested for the first time. This comprised a group of calves, seven in number, and all contacts with the calf which reacted on February 2, 1934, only 2 of which passed the test. These 2 animals were kept separate and, when the whole herd was tested on July 20, 1934, they were the only animals to react. As these animals had been kept separate there was no need to retest any at the usual 3 months interval.

At the test that followed, all the 84 animals passed the test. The test, made on April 12, 1935, comprised 12 heifer calves which had been imported from Guernsey three months before, and 2 home-bred calves tested for the first time. The complete test made on July 18, 1935, revealed one reactor, a cow 3 years old, and it is not possible to say where infection arose in this instance. As will be seen from Table V, this was the only animal over 2 years of age to react during 2½ years of testing.

In the main, there were two series of infection, both among young heifers; but, having regard to the risk of taking the calves from reacting cows, this risk was apparent, and the practice of testing young, and retesting all contacts, was adopted to allow of early detection.

The progeny of one particular cow was very unfortunate; D. 130, D.A. 130 and D.B. 130 were all out of the same cow, but, unfortunately, this cow had been disposed of before the fact that her 3 successive calves all reacted, was recognized. D.B. 130, which reacted on February 2, 1934, was the sole reactor at that time in a group of calves, but the whole group subsequently reacted.

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TABLE V.

<i>Date of Test.</i>	<i>No. of Animal.</i>	<i>Age at date of Reaction.</i>
26/1/33	D.130	18 months
26/1/33	D.116	17 "
26/1/33	D.128	8 "
26/1/33	D.145	7 "
27/4/33	D.A.130	10 "
27/4/33	D.17	8 "
27/4/33	D.88	5 "
21/7/33	D.120	22 "
2/2/34	D.B.130	6 "
17/4/34	D.147	9 "
17/4/34	D.131	9 "
17/4/34	D.150	8 "
17/4/34	D.170	7 "
17/4/34	D.92	5 "
20/7/34	D.158	6 "
20/7/34	D.176	6 "
18/7/35	196	36 "

It was a fortunate precaution to isolate D.158 and D.176 after they passed the test on April 17, 1934. This isolation, apparently, was enough to hold the spread of infection in check.

This experience has indicated that even badly-infected pastures can be used again after six months' rest. The premises where the calves were kept, after they were 3 months' old, were not easy to disinfect and cleanse. The walls were flint-built and very rough and eventually they were faced with smooth cement. Disinfection in every instance, meant a thorough scrubbing of the interiors and repeated spraying with disinfectant. As long as reacting animals are on the same farm, even with very good conditions for segregation, it must be apparent that there is some risk of a spread of infection. The success, attained in rearing calves from reacting cows however, was such as to enable the whole of the reacting animals to be sold without upsetting the milk-production programme.

The results are better than even the most optimistic would have predicted. The conditions that prevailed were only ordinary commercial facilities; the rearing quarters were very old buildings, but, beyond the facing of the walls with cement, no alterations were made. Two sets of buildings were available for milking, the one set being used only for non-reacting cows.

Pastures were freed from infection simply by leaving them untouched for six months, and, for convenience, this was

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done during winter. The only treatment consisted of severe harrowing in early winter to break up all manure droppings.

Considerable importance was attached to the testing of young stock; and, when a reactor was found, the test was repeated within 3 months on all animals that could be or had been contacts.

Nothing could be more complete than the breakdown that occurred in 1931, and yet, within 4 years, a self-contained Tuberculin Tested herd has been established by means of segregation on a farm from which, during that period, 11 animals were disposed of under the Tuberculosis Order.

THE CULTIVATION OF CHICORY AS A VEGETABLE

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THE leaves of the chicory plant, when grown in the dark, are used as a vegetable and as a salad. When grown without any covering of soil they come open and loose as in seakale, etc., and are used as a salad. There is very little demand for this type in England. When grown under a covering of soil the leaves come up in a closely packed head. These heads are known as chicons. When cooked they are of delicate flavour. The demand in England at present is rather limited, but the excellence of the chicons as a vegetable should ensure increased consumption if the good qualities were made known to a wider public.

The culture of chicory as a vegetable is a speciality of the Belgians, who export considerable quantities both to this country and to America. Chicory has not been grown to any extent commercially in this country until the last year or two. The following observations are based on experience in growing the crop at the Kirton Agricultural Institute since 1932.

Seed. Great care is necessary in the selection of seed. A poor strain will produce loose, open chicons of irregular size, and a large percentage will be unmarketable. Only specially selected strains should be used.

Seed should be sown towards the end of May, or early in June. If it is sown too early, many bolters—which are useless for forcing—are produced. Also, many of the roots will be large and coarse, and medium-sized roots of good shape are required. The seed should be sown in rows 12-14 in. apart, about 2½ lb. of seed being required per acre.

Soil. A medium loam is the most suitable for chicory. Well-grown roots produce the finest chicons, and deep preparation of the soil is essential. The roots are best grown on land that has been well done for the previous crop, but if

CULTIVATION OF CHICORY AS A VEGETABLE

an application of farmyard manure is considered necessary, it should be ploughed under in the previous autumn.

Before the seed is sown the soil should be worked down to a reasonably fine tilth.

After-cultivation. When the young seedlings appear, the land should be hoed. This should be repeated at intervals until the plants meet in the inter-rows. As soon as the seedlings are large enough to handle, they should be singled out to 8 in. apart.

Lifting and Storing. The roots should be ready for lifting in October and November. They are sensitive to frost, and should be lifted and stored before severe frost sets in.

They may be lifted by a fork or plough. There would appear to be no objection to the latter, as bleeding of broken roots is not detrimental, as with chicory grown for mixing with coffee. If the rows are grown close together, say 12 in. apart, a number of crowns are likely to be damaged by the horses' feet. Lifting by hand is the most efficient method, but is expensive.

No elaborate storage is necessary for the roots. At Kirton, satisfactory storage was obtained by taking out a deep furrow with a plough, lifting the roots of the adjoining four rows of chicory, laying them in the furrow or trench, and ploughing back the soil over the roots. When lifted for storing, the foliage must not be removed, because if this is done and the weather is mild, fresh growth will rise from the crown, to the detriment of the subsequent chicons. Also, the foliage helps to protect the crowns from frost damage. If frost is likely to become severe, further soil may be thrown over the crowns and foliage with the plough.

Forcing. On the Continent, somewhat elaborate plant is used for forcing chicory, specially constructed houses fitted with a hot-water heating system, being commonly used. Excellent results, however, can be obtained very simply out of doors, and if farmyard manure is available, supplies of forced chicons can be obtained throughout the winter.

For forcing out of doors, a pit about 7 ft. wide and 1½ ft. deep should be dug. The roots are then prepared by cutting off the foliage about 1½ in. above the crown. The cut must not be too near the crown, or the young centres which form

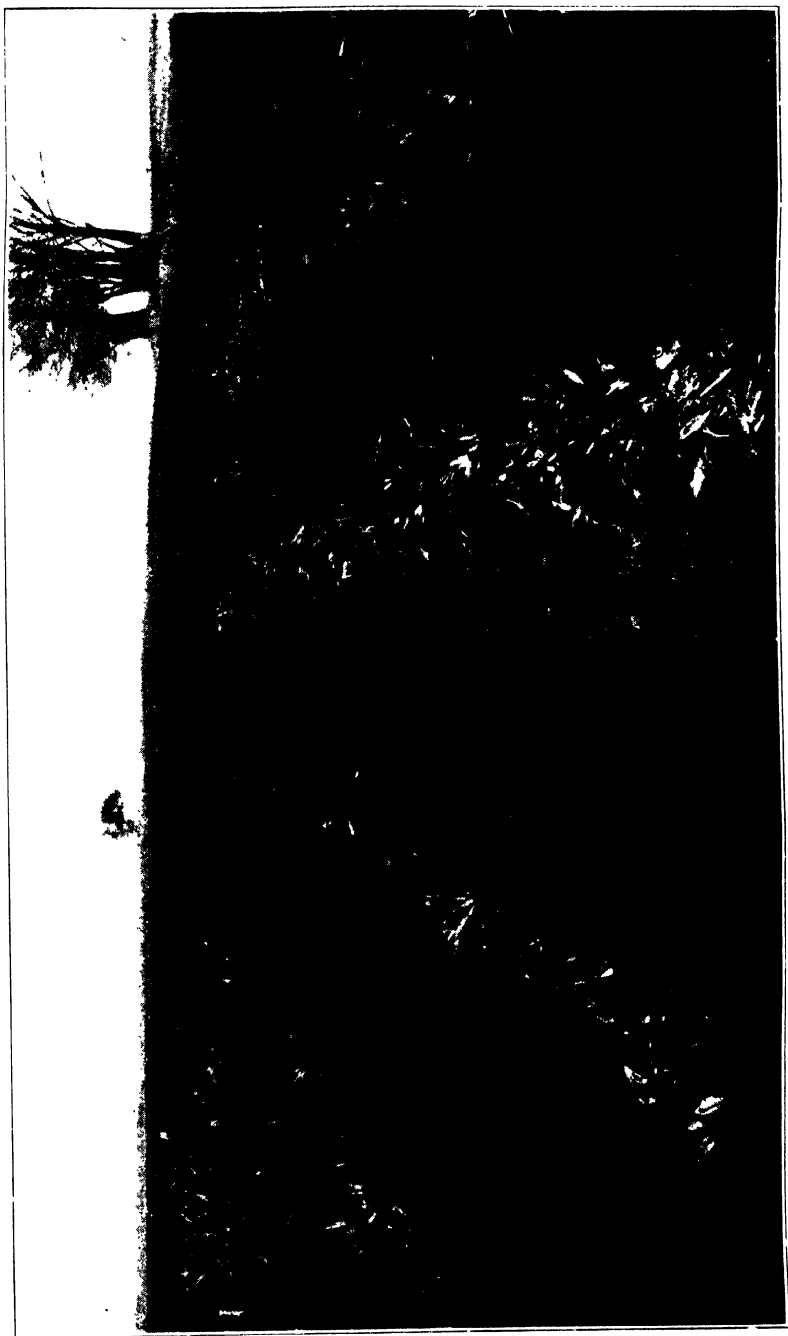


Photo: J. C. Wallace.

FIG. 1.—Method of laying roots in trenches for the Winter.



FIG. 2.—Unsuitable roots

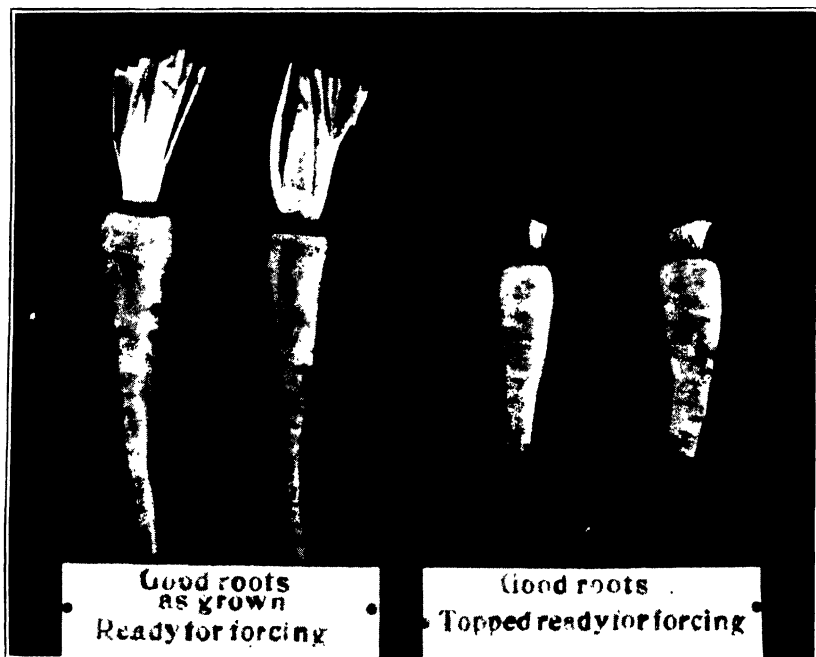
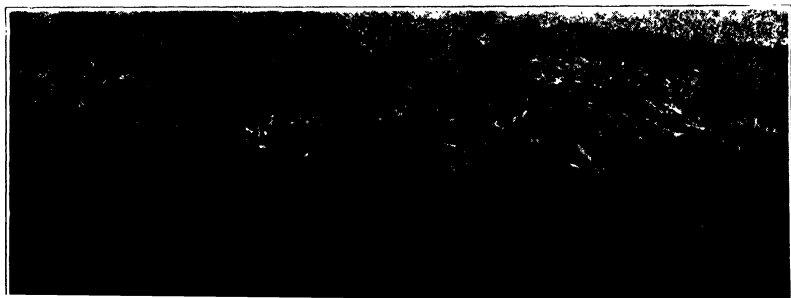


FIG. 3.—Roots suitable for forcing. Those on the right are topped and shortened to 8 in., and are ready for placing in the pit.

Photos. J. C. Wallace.



FIG. 4.—The forcing bed, with roots in position and first covering of soil



Photos: J. C. Wallace.

FIG. 5.—The chicons partly grown. This view also shows the final covering of soil and farmyard manure on the forcing bed.

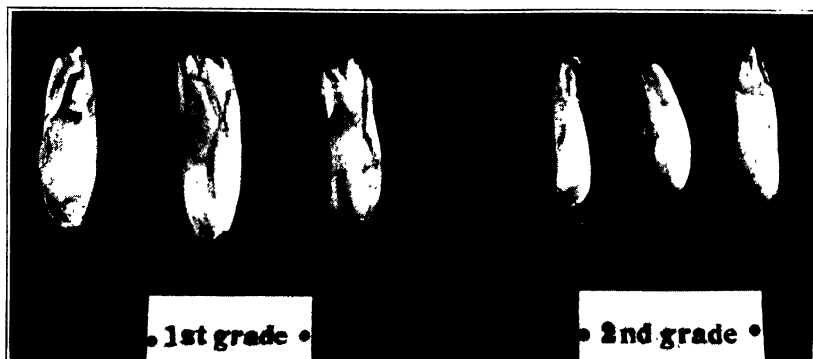


FIG. 6.—First Grade and Second Grade chicons



FIG. 7.—Method of Packing chicons. Grade 1 and Grade 2.



Photos: J. C. Wallace.

FIG. 8.—Selection for seed. A. Suitable heads. B. Unsuitable heads (note the type of growth on the large, coarse roots).

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the chicons will be damaged. The roots should then be shortened to a length of 8 in. by cutting off the root tip. This is to ensure that the crowns, when placed in the pit, are on one level. Small, or very coarse roots, should be discarded.

It is advisable to place in the bottom of the pit a few inches of soil, into which the roots can be pressed. They should be put in rows arranged half-an-inch apart from shoulder to shoulder in the rows, and 1 in. from the adjoining row. The interspaces may be filled with soil. If the soil is dry, the roots may then be watered. They must then be covered with about 9 in. of dry soil of a light character. This does not mean soil that has been artificially dried, but soil containing only natural moisture. This is very important. If the covering soil is wet, or becomes wet, it will adhere to the chicons. The chicons must not be washed to remove the soil, and the only way of cleaning them is to remove the outer leaves. Neither must the soil used for covering the roots contain an excess of humus, or rotting of the chicons may result. Dry sand is not suitable, as it works in between the leaves of the chicons. These are generally cooked whole, and no amount of washing before cooking will extract the sand. (It is advisable to take steps at the end of the summer to protect the soil to be used for covering the roots from the heavy autumn rains. This can be done by sheets of corrugated iron or wooden hurdles. These may be placed over the sites for the beds and on the soil adjoining.)

To force the chicons into more rapid growth, a layer of farmyard manure may be placed on the soil covering the roots. This layer may be from 8-12 in. in thickness, according to the temperature in the pit or the rate at which it is desired to force the chicory. Horse-manure is the best for this purpose. Pig-manure should not be used. Serious rotting of the chicons has resulted from the liquid of pig-manure soaking into the soil.

To conserve the heat, and, perhaps more important, to keep the rains from wetting the soil covering the roots, the pit should be protected by sheets of corrugated iron or by straw or wooden hurdles. These may be made to form a ridged roof over the pit, to run the water off to both sides. The open ends can be filled with straw to conserve the heat. Another advantage of covering the pit with hurdles is that it helps to maintain a uniform temperature over the whole of the pit, and thus ensures uniform growth of the chicons. If

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the pit is not protected, and cold winds prevail, the chicons on the windward side will be retarded in growth.

A very high temperature is not necessary. The most suitable is from 58° to 68°. At this temperature, close, firm chicons, crisp and of good flavour, will be produced. One or more thermometers should be kept in the pit. These should be inserted in hollow tubes, and the base of the thermometer should be on a level with the crowns of the roots. Should the temperature rise too high, the quantity of manure covering the pit must be reduced. At a temperature of 60° the chicons should be ready for market in from three to four weeks. For late spring production, the roots may be put down in January and allowed to develop without the aid of heat from farmyard manure. These will be ready in April and May.

Packing. The chicons are ready for removal just before the tips reach the top of the soil. They must not come through the soil and into contact with the manure. Lifting should commence at one end of the pit, the hurdles and the manure being first removed. A trench should be opened out to the depth of the base of the roots. The roots with the chicons attached are then dug out with a fork. The chicons may then be removed from the roots by giving them a sharp twist. This is better than cutting. They should then be taken to the packing shed. Any discoloured outer leaves, and any very dirty leaves, should be removed, and the roots sorted into two grades. The first grade should consist of clean, compact chicons of from 6-8 in. long. The second grade may contain the shorter, compact chicons and the looser, longer ones. Very loose open chicons should not be included, neither should any misshapen or diseased ones.

The most convenient containers for marketing chicory are non-returnable 14 lb. plum boxes. These hold about 12 lb. of chicons. They should be lined with blue or white paper, and the chicons should be neatly packed with their bases towards the outside of the box.

Costs of Production. The crop is comparatively expensive to grow and it cannot be classed as a cheap vegetable. Until the winter of 1934-35, prices have been such as to leave a little profit to the grower, but last winter heavy importations from the Continent reduced returns to below the cost of production.

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The following are the approximate costs of growing the crop last year at Kirton :

Cultivation, per acre :

	£	s.	d.
Ploughing	0	17	0
Preparation	0	10	0
Seed	1	10	0
Drilling	0	5	3
Push Hoeing	0	12	0
Chopping out	0	17	9
Singling	0	15	0
Hoeing	1	1	4
Digging roots and laying in trench ..	*5	12	9
Rent	5	0	0
Rates and Overhead	1	0	0
	<hr style="width: 100px; margin-left: 0;"/> £18 1 1		

* This figure may be reduced somewhat if the roots are ploughed out, instead of being lifted by hand. Serious damage to the crowns may, however, be caused by the horses' feet.

The estimated yield of roots (after topping) was from 8 to 9 tons per acre. This is less than the estimated yield on another farm in the district, but the total cultivation costs are lower.

The yield of roots in Belgium is said to be much above that obtained at Kirton.

Forcing, per acre :

Preparing roots, placing in trench, covering, lifting, cleaning and packing, and carting manure	£16 13s. 10½d.
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This figure will be governed by the yield of roots per acre, a higher yield entailing more roots to handle, more trench space and more lifting and packing, and also by the yield of chicons per acre.

The total costs of production for one acre are thus £34 14s. 11½d., including all items up to the point when the chicory is ready for sending to market.

The yield of chicons obtained at Kirton was about 26 cwt. per acre. This is again much below that obtained on another farm, and much below the figure given for Belgium. It is possible that the crop at Kirton was marketed at too young a stage, and that the chicons should have been allowed to grow a few inches longer. They were certainly much more compact, firmer and shorter, than imported chicons.

Marketing Costs. Marketing costs per acre will depend upon the yield of chicons per acre, but the cost per box should

CULTIVATION OF CHICORY AS A VEGETABLE

remain about the same. The following were the costs per box :

Box	..	..	..	..	2½d.	
Paper	..	..	..	..	¾d.	
Rail charges	..	..	..	..	5½d.	
Salesman's charges	..	..	..	..	2½d.	
Cartage to Station	..	..	..	..	½d.	1s. 0½d. per box.

Total Cost of Production. It will be realized that the cost of producing 1 lb. of chicons will depend to a large extent upon the yield of chicons per acre. At Kirton, the cost per lb. reached the high figure of 4d., but this can be accounted for by the low yield of chicons, due probably to an insufficient number of roots per acre and to removing the forced chicons too soon from the pit. It is doubtful, however, if the cost of producing and marketing chicory, even under the best conditions, can be less than 3d. per lb.

The returns obtained in 1934-35, owing to the heavy importation, were much below the cost of production.

Summary. There is a limited demand for forced chicory, but the demand could no doubt be increased.

Forced chicory has in the past been almost entirely a Continental product.

The crop can be satisfactorily grown in England.

It is very important to obtain a good strain of seed.

Forcing can be done in outdoor pits, the necessary temperature being obtained by a covering of farmyard manure.

No elaborate forcing plant is necessary.

The crop is expensive to produce.

Until last winter the returns have left a little profit.

Heavy importation reduced the return in 1934-35 much below the costs of production.

AMALGAMATION OF THE BEET SUGAR MANUFACTURING COMPANIES

THE proposals of the Government with regard to sugar (Cmd. 4964)* were given in the issue of this JOURNAL for September, 1935 (pages 533-541). In proposing the continued assistance of the beet sugar industry, the Government stated that they would adopt the recommendation of the Greene Committee, that the existing beet sugar manufacturing companies in Great Britain should be amalgamated in a single Corporation under the supervision of a Sugar Commission.

As announced in this JOURNAL for November, 1935 (p. 809), an informal Tribunal was appointed by the Chancellor of the Exchequer and the Minister of Agriculture and Fisheries, to examine and advise the Government upon any scheme of amalgamation submitted for approval by or on behalf of the fifteen companies concerned.

Such a scheme was submitted in November, 1935, by the Beet Sugar Factories Committee, but was withdrawn after discussion with the Tribunal. Revised Arrangements were submitted to the Tribunal in February, 1936. These, as amended at the instance of the Tribunal, were published on March 27, 1936, in a White Paper (Cmd. 5139)† which also contained a report of the Tribunal recommending the Arrangements for the approval of the Government. The White Paper announced that the Minister of Agriculture and Fisheries and the Treasury were prepared to give the necessary approval and consent to the Arrangements if and when the Sugar Industry (Reorganization) Bill now before Parliament became law. Accordingly, as soon as the companies themselves have formally endorsed the work of their representatives, it will be possible for amalgamation to be carried through without recourse to the compulsory powers contained in the Sugar Industry (Reorganization) Bill.

The Arrangements are summarized and explained below:

Formation of the British Sugar Corporation Ltd. A British Sugar Corporation, with limited liability, is to be

* Obtainable from H.M. Stationery Office, price 2d., post free 2½d.

† Obtainable from H.M. Stationery Office, price 3d., post free 3½d.

AMALGAMATION OF BEET SUGAR MANUFACTURING COMPANIES

formed to acquire and operate the undertakings the existing companies as from April 1, 1936. The companies are to be liable for the normal work of maintenance of factories from the close of the 1935-36 campaign to March 31; thereafter, this work will be carried out by or on behalf of the Corporation.

Capitalization. The fixed assets of the companies are to be transferred to the Corporation in exchange for fully paid-up ordinary shares of a total nominal value of £5,000,000, this being an agreed figure based on depreciated replacement (not original) costs. The Corporation will have an authorized amount of debenture stock sufficient to raise £1,000,000, of which it is proposed to issue in the first place sufficient to furnish a sum of not more than £750,000 for working capital. This issue is to be guaranteed as to principal and interest by the Treasury under powers to be conferred by the Sugar Industry (Reorganization) Bill, and is to be taken up by the transferor companies for cash, without underwriting charges or commission.

Return on Capital. Under the Sugar Industry (Reorganization) Bill, Exchequer assistance will be in the nature of a deficiency payment to fill the gap between the Corporation's income and outgoings. The Tribunal recommend that Exchequer assistance should be calculated on the assumption, *inter alia*, that in the circumstances existing at the present time, a reasonable rate of interest on the Corporation's share capital would be 4 per cent. plus anything that may be earned under the incentive agreement referred to in the following paragraph.

Owing to the method by which State assistance is to be calculated, the Tribunal considered it necessary to provide some incentive to the Corporation to make a sustained effort to reduce working costs. This incentive is to be secured by an agreement between the Minister and the Corporation as to the division between the State and the Corporation of savings resulting from the economies effected in working costs. The share retained by the Corporation in any year will decline as time goes on, in accordance with a table reproduced in the White Paper, but the bigger the saving the more gradual will be the decline.

For the purpose of determining the rate of assistance for any year, the economies achieved by the Corporation will be

AMALGAMATION OF BEET SUGAR MANUFACTURING COMPANIES

calculated as the difference between the following two amounts :

- (a) the estimated net annual loss, assuming normal conditions and calculated as if, having regard to the time that has elapsed since the amalgamation of the transferor companies into the Corporation, all practicable economies resulting from that amalgamation had been effected, and as if the highest practicable standard of efficiency in the business carried on by the Corporation had been attained by the commencement of the year, for which the rate of assistance is being fixed ;
- (b) the estimated net annual loss, assuming the same conditions, but calculated as if the undertakings were being carried on at the level of efficiency attained by March 31, 1936.

The estimated net loss will be ascertained in both cases after debiting the amount allowed for interest on the capital employed in the business other than borrowed working capital, but before crediting direct assistance or charging income tax. In calculating the " estimated net loss," the following factors are to be dealt with in the manner indicated :

- (i) Variations in the cost of beet are not to be taken into account.
- (ii) Contributions for the maintenance of a pensions scheme for employees of the Corporation are not to be taken into account.
- (iii) Directors' fees on the scale applicable to the year for which the rate is being fixed are to be included in (a), and directors' fees on the scale in force at March 31, 1936, are to be included in (b).
- (iv) Such annual charges of the Sugar Commission as are recoverable from the Corporation are to be included in (a).
- (v) Subject to the foregoing all income received and expenditure incurred in connection with the business of manufacturing sugar and sugar products are to be taken into account.

Any doubt as to whether a particular reduction in the " estimated net loss " is attributable to economies which have been achieved by the Corporation is to be decided by the Sugar Commission.

The effect of the proposed incentive agreement on the earnings of the Corporation will depend upon the economies made, but it is not possible to make any close estimate of the economies that can be effected. If, however, it is assumed, for example :

- (a) that the Treasury will consider it reasonable each year to fix a basic rate of interest of 4 per cent. per annum, and
- (b) that economies ultimately amounting to £300,000 per annum can be gradually effected within six or seven years.

The earnings which the Corporation would be permitted to retain under the arrangements would be equivalent to an average, over the period of ten years ending March, 1947, of approximately $5\frac{1}{2}$ per cent. per annum on the share capital (i.e., the assumed basic rate of 4 per cent., plus $1\frac{1}{2}$ per cent,

under the Incentive Agreement. Any sums required for dividend equalization or other general reserves would have to be provided out of these earnings.

On these assumptions, the total value of economies throughout the whole ten years would be approximately £2,350,000, of which the Corporation would retain 32 per cent., the remaining 68 per cent., or say £1,600,000, accruing to the State by way of saving in the cost of direct assistance to the industry. The proportion which would go to the State would progressively increase from year to year until eventually the State would be enjoying 83½ per cent. of the economies, i.e., there would be over £250,000 per annum saving in direct assistance, irrespective of saving due to any other causes.

At the end of the ten-year period, assuming that no further economies can be achieved by the Corporation, the share of the proceeds of these economies retainable by the Corporation would gradually diminish until its earnings were just below 5 per cent. on the share capital. It would, however, be open to the Corporation, and it would doubtless be their policy in the circumstances assumed above, to endeavour to maintain a level rate of dividend distribution by restricting the payment of dividend below the current level of earnings during the first ten years and applying the surplus to the building up of a dividend equalization reserve, the interest on which would enable them to supplement the earnings available from State assistance during the subsequent period.

Save in exceptional circumstances, and with the prior approval of the Sugar Commission and the Government, the rate of dividend may not exceed 7 per cent. per annum. If the Corporation should require in any year to draw on its reserves in order to pay the basic dividend of 4 per cent. on its capital, representations may be made by the Corporation to the Sugar Commission that they should recommend to the Government that provision should be made in the rate of assistance towards replacing the amount withdrawn for this purpose.

Control and Management. In view of the public interest involved, provision will be made in the Memorandum and Articles of Association of the Corporation for giving effect to the following:

- (1) The Chairman of the Corporation to be appointed by the Government; provision to be made for the appointment by the Government of two other members of the Board.

AMALGAMATION OF BEEF SUGAR MANUFACTURING COMPANIES

- (2) The appointment of every original member of the Board to be subject to the approval of the Government after consultation with the Sugar Commission, and no nomination for election to a vacancy to be made, either by the Board or by the shareholders, except after consultation with the Sugar Commission.
- (3) The Chairman of the Board to have the right of suspensory veto, pending reference to the Government, on any proposal coming before the Board which in his opinion involves questions of public interest; the veto to become absolute if the Government should so decide.
- (4) The managerial and administrative structure of the Corporation, and all appointments of personnel to the higher executive posts, to be subject to prior consultation with the Sugar Commission, and, in the case of the original structure and the original appointments, to the approval of the Treasury.

It is proposed that the Government should use only the powers under (3) above in regard to matters of public interest such as might arise in regard to the production and marketing of white sugar and the maintenance of the independent status of the Corporation. A further proposal is that the Corporation and the refiners should be invited by the Government to state their intention to operate an Industrial Agreement in a spirit of friendly co-operation and in conformity with the maintenance of the independent commercial status of the Corporation.

The Sugar Industry (Reorganization) Bill provides for further measures as follows:

- (a) The approval of the Minister, with the consent of the Treasury, to be required for any alteration of the Memorandum and Articles of Association of the Corporation.
- (b) The Corporation to submit each year to the Sugar Commission for approval, a statement of the Corporation's policy with regard to the production and marketing of white sugar during that year; the Commission's approval also to be obtained for any alteration in that policy.

Pensions Scheme. The Corporation is to inaugurate a pension scheme as soon as possible after its formation. The Sugar Commission is to approve the employees to whom the scheme will apply and the scale of benefits and contributions.

Appointment of Chairman-Designate. During the debate on the Third Reading of the Sugar Industry (Reorganization) Bill in the House of Commons on April 7, it was announced that Lt.-Col. Sir Francis Humphrys, G.C.M.G., G.C.V.O., K.B.E., C.I.E., Chairman of the Sugar Tribunal, had accepted an invitation from the Government to serve as Chairman of the Corporation in due course.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934 AND 1935. NUMBER, WEIGHT AND PRICES OF CATTLE CERTIFIED FOR PAYMENTS

IN the issues of this JOURNAL for May, August and November, 1935, information was given regarding the cattle and carcasses of cattle certified for payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, during the first twelve months of the Scheme. Similar information is now available for the six months, September, 1935, to February, 1936, and in this article the particulars for these months are set out on similar lines to those previously published and are compared with the data for the corresponding period a year earlier.

As mentioned in the previous reports, the classes of cattle in respect of which payments are made are steers, heifers and cow-heifers; a cow-heifer is defined as an animal that has calved and has grown not more than six permanent incisor teeth. The standard required from September 1 to December 31, 1934, was that an animal should have an estimated killing-out percentage of not less than 52 per cent., and from January 1, 1935, a killing-out percentage of not less than 54 per cent.

The total numbers of each class of cattle certified in the six months ended February 29, 1936, together with comparative figures for the six months ended February 28, 1935, are given in Table I.

As has been pointed out in previous articles, the rate of marketing of fat cattle from month to month cannot be judged accurately from these figures, owing to the fact that the great majority of fat-stock markets are held on the early days of the week; but useful comparisons are possible for three-monthly periods.

The number of cattle certified in the three months, September to November, 1935, exceeded the number in the corresponding three months of 1934 by 17 per cent., while in the three months, December, 1935, to February, 1936, there was an increase of slightly over 10 per cent. as compared with the corresponding period a year earlier. Over the whole six months the increase was nearly 14 per cent.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

TABLE I.

	Steers No.		Heifers No.		Cow-Heifers No.		Total No.	
	1935-6	1934-5	1935-6	1934-5	1935-6	1934-5	1935-6	1934-5
September	74,581	62,104	63,248	49,534	4,521	3,792	142,350	115,430
October ..	77,652	69,276	65,826	58,466	4,558	4,592	148,036	132,334
November	66,745	58,411	60,529	50,749	4,702	4,131	131,976	113,291
Total : Sept. to November	218,978	189,791	189,603	158,749	13,781	12,515	422,362	361,055
December	74,891	63,638	58,539	51,083	4,410	3,832	137,840	118,553
January .	83,819	82, 94	54,047	51,862	5,655	4,953	143,521	138,909
February ..	85,290	77,696	47,597	41,212	5,423	4,421	138,310	123,329
Total : Dec. to February ..	244,000	223,428	160,183	144,157	15,488	13,206	419,671	380,791
Total (6 months)	462,978	413,219	349,786	302,906	29,269	25,721	842,033	741,846

As regards the different classes of animal, the number of steers increased by 15 per cent. in the three months, September to November, 1935, compared with the corresponding three months of 1934, and by 9 per cent. in the three months, December, 1935, to February, 1936, compared with the corresponding period of 1934-35. Heifers increased by 19 and 11 per cent. in the two periods respectively, and cow-heifers by 10 and 17 per cent. respectively.

When the numbers of cattle certified each month are adjusted in order to allow, so far as is possible, for the fact that a large number of fat-cattle markets are held on Mondays, and that the number of markets held decreases day by day as the week proceeds, it would appear that the rate of marketing of eligible cattle in September, 1935, was higher than in September, 1934 by 13.9 per cent.; in October by 16.3 per cent.; in November by 17.8 per cent.; in December by 10.8 per cent.; in January by 6.7 per cent.; and in February by 10.6 per cent.

Live-Weight Certifications. Animals certified at Live-Weight Certification Centres accounted for 409,621 of the total of 422,362 animals certified at Live-Weight and Dead-

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

TABLE II.—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM SEPTEMBER, 1935, TO FEBRUARY, 1936.*

Agricultural Divisions	Steers						Heifers					
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
ENGLAND (excluding Monmouth)												
East ..	3,158	3,392	2,915	3,830	3,901	4,171	2,709	2,923	2,625	2,747	2,721	2,537
North-East ..	7,245	5,809	4,796	5,907	9,045	11,583	2,301	2,195	1,796	1,813	2,696	2,619
South-East ..	1,554	1,608	1,295	2,241	1,567	1,629	2,315	2,454	2,439	2,779	2,115	2,002
East Midlands ..	8,947	8,826	8,192	7,239	6,385	5,178	7,184	7,399	7,200	6,182	4,856	3,934
West Midlands ..	3,320	3,364	2,990	4,224	4,396	4,774	5,299	5,480	5,074	5,568	5,420	5,115
South-West ..	3,803	3,393	3,393	4,205	4,154	3,798	4,790	5,287	5,192	5,027	4,723	3,929
North ..	7,878	8,876	8,014	8,844	11,331	12,372	13,798	12,978	11,878	9,304	7,663	6,651
North-West ..	4,261	5,099	4,373	3,633	3,691	3,660	9,441	9,970	8,147	7,412	6,446	5,394
Wales (including Monmouth)												
Total ..	40,166	41,044	35,968	40,134	45,370	47,365	47,837	48,686	44,351	40,892	36,640	32,181
North ..	2,581	2,634	2,235	2,719	2,625	2,636	1,716	1,918	1,560	1,536	1,481	1,119
South ..	1,725	1,951	1,946	2,519	2,324	2,133	2,440	2,692	2,568	2,924	2,243	1,786
Scotland												
Total ..	4,306	4,585	4,181	5,238	4,949	4,769	4,156	4,610	4,128	4,460	3,724	2,899
North-East ..	3,848	4,348	4,292	4,963	5,320	4,230	3,601	3,691	3,839	4,521	4,803	4,146
East Central ..	6,075	4,581	4,245	5,105	5,044	5,732	665	576	545	1,009	1,148	1,353
South-East ..	4,341	4,470	3,509	4,849	4,763	5,230	177	202	236	452	353	369
W. & S.-West ..	4,763	5,241	3,901	4,418	4,914	4,315	2,167	2,438	1,975	2,214	1,920	1,613
N. & N.-West ..	665	657	591	742	705	869	393	386	470	552	576	534
Northern Ireland												
Total ..	19,692	19,297	16,538	20,137	20,746	20,516	7,003	7,377	7,065	8,748	8,800	8,015
Total United Kingdom												
Total ..	8,034	10,366	7,686	7,909	10,027	10,199	2,804	3,408	3,171	3,293	3,323	3,289
Total United Kingdom												
Total ..	72,198	75,292	64,373	73,418	81,092	82,849	61,800	64,081	58,715	57,393	52,687	46,384

* Details of the monthly figures from September, 1934, to February, 1935, are given on pages 144 and 145 of this *Journal* for May, 1935; from March, 1935, to May, 1935, on page 467 of this *Journal* for August, 1935; and from June to August, 1935, on page 799 of this *Journal* for November, 1935.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

TABLE II (continued).—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM SEPTEMBER, 1935, TO FEBRUARY, 1936.

Agricultural Divisions	Cow-Heifers					Total				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Sept.	Oct.	Nov.	Dec.
ENGLAND (excluding Monmouth)	East ..	135	193	113	224	191	5,955	6,450	5,733	6,690
	North-East ..	106	103	113	162	160	8,107	8,107	6,703	7,833
	South-East ..	128	125	140	115	138	16,652	16,607	15,718	13,726
	East Midlands ..	404	382	326	294	288	8,939	9,151	9,294	9,811
	West Midlands ..	320	307	308	295	364	22,394	22,502	20,628	18,905
WALES (including Monmouth)	South-West ..	697	709	709	579	792	14,798	91,560	83,945	84,328
	North ..	718	648	736	697	782	4,339	4,612	3,881	4,333
	North-West ..	1,096	1,139	1,096	1,525	1,498	4,337	4,855	4,721	5,050
Total ..	3,557	3,548	3,626	3,302	4,430	4,208	8,696	9,467	8,602	9,983
SCOTLAND	North ..	62	60	78	88	89	7,903	8,099	8,200	9,554
	South ..	172	212	207	215	196	6,761	5,169	4,815	6,213
	Total ..	234	272	293	303	285	4,532	4,771	3,752	5,320
NORTHERN IRELAND	North-East ..	54	60	69	70	65	7,208	7,918	6,100	6,875
	East-Central ..	21	12	25	39	22	1,005	1,045	1,080	1,308
	South-East ..	4	9	7	19	11	27,059	27,002	23,947	29,270
TOTAL UNITED KINGDOM	W. & S.-West ..	278	239	224	243	238	11,029	13,985	11,051	11,437
	N. & N.-West ..	7	8	19	14	24	138,344	143,732	127,545	135,018
	Total ..	364	328	344	385	356	13,794	13,794	13,794	13,794
The Agricultural Divisions comprise the Counties of:—										
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>ENGLAND— Bedford, Huntingdon, Cambridge, Suffolk, Essex, Hertford, Middlesex and London. North-East: Norfolk, Lincoln and York, East Riding. South-East: Kent, Surrey, Sussex, Berkshire and Hampshire. East Midlands: Nottingham, Leicester, Rutland, Northampton, Buckingham, Oxford and Warwick. West Midlands: Salop, Worcester, Gloucester, Wiltshire and Hereford. South-West: Devon and Cornwall, Dorset, Devon and Somerset, Devon and Devon. North: Northumbria, Durham, Lancashire, North and West Ridings. North-West: Cumberland, Westmorland, Lancashire, Chester, Derby and Stafford.</p> </div> <div style="width: 48%;"> <p>WALES— North: Anglesey, Carnarvon, Merioneth, Montgomery, Denbigh and Flint. South: Cardigan, Brecon, Monmouth, Glamorgan, Carmarthen and Pembroke. SCOTLAND— North-East: Nairn, Moray, Banff, Aberdeen and Kincardine. East-Central: Angus, Perth, Fife, Clackmannan and Kinross. South-East: West Lothian, Midlothian, East Lothian, Berwick, Roxburgh, Selkirk and Peebles. West and South-West: Argyll, Bute, Dumfriesshire, Stirling, Lanark, Renfrew, Ayr, Dumfries and Galloway, Highland and Western Isles. North-West: Zetland, Orkney, Caithness, Sutherland, Ross and Cromarty and Inverness.</p> </div> </div>										

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

Weight Centres in the three months, September to November, 1935, and for 408,547 of the total of 419,671 animals certified in the three months, December, 1935, to February, 1936. Details of the numbers of each class of animal certified at Live-Weight Centres in each of the agricultural divisions into which the country is divided are given in Table II.

Table III shows the number of animals certified at Live-Weight Certification Centres in England, Wales, Scotland, Northern Ireland and the United Kingdom respectively, in September, 1935, to February, 1936, compared with the same period in 1934-35:

TABLE III

	September–November				December–February			
	1935-36		1934-35		1935-36		1934-35	
	Number	Per cent.	Number	Per cent.	Number	Per cent.	Number	Per cent.
England ..	268,783	65·6	233,112	66·1	254,522	62·3	234,020	62·9
Wales ..	26,765	6·5	24,750	7·0	26,912	6·6	28,415	7·6
Scotland ..	78,008	19·1	74,670	21·1	88,088	21·6	82,145	22·1
N. Ireland	36,065	8·8	20,438	5·8	39,025	9·5	27,382	7·4
TOTAL : United Kingdom	409,621	100	352,970	100	408,547	100	371,962	100

It will be seen from Table III that the largest proportionate increase occurred in Northern Ireland, where the number of animals certified in September to November, 1935, exceeded the number certified in the first three months of the scheme by nearly $76\frac{1}{2}$ per cent., and, in December, 1935, to February, 1936, the numbers were $42\frac{1}{2}$ per cent. higher than in the corresponding period in 1934-35. Wales, on the other hand, while showing an increase of over 8 per cent. in September to November, 1935, showed a decrease of over 5 per cent. in the following three months as compared with a year earlier.

A comparison between the numbers of animals certified in the different agricultural divisions shows that, while the number certified in England in the three months September to November, 1935, was 15·3 per cent. higher than in the corresponding period of 1935, the North-Western Division (Cumberland, Westmorland, Lancashire, Cheshire, Derby

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

and Stafford) showed the largest percentage increase with 26·7 per cent. In the North-Eastern Division (Norfolk, Lincoln and York, East Riding) there was a small reduction (2·9 per cent.) compared with the corresponding three months of 1934. In the other divisions of England there were increases of between 14·6 and 16·8 per cent.

As regards the three months, December, 1935, to February, 1936, the number of animals certified in England was 8·8 per cent. higher than a year earlier. Each division shared the increase to some extent, and the North-Western Division again showed relatively the largest increase, 14·0 per cent., while the North-Eastern showed an increase of 4·4 per cent. The South-Western Division had relatively the smallest increase (0·6 per cent.) and the West Midland Division was also below the average with a rise of 3·7 per cent. The North, East and East Midland Divisions were higher by 13·5, 11·8 and 11·4 per cent. respectively.

In Wales, as already mentioned, the number of animals certified in the three months September to November, 1935, was higher than in the corresponding three months of 1934 by 8 per cent. The Northern half of Wales was responsible for most of this increase, and showed a rise of 14·6 per cent. against 2·8 per cent. in South Wales. The two divisions respectively showed decreases of 6·8 per cent. and 3·9 per cent. in December to February, 1935-36, as compared with the corresponding period of 1934-35.

Each division of Scotland, with the exception of the South-Eastern Division, in which 3·3 per cent. fewer animals were certified, contributed towards the increase of 4·5 per cent. in Scotland in the September to November, 1935, quarter compared with 1934. The South-Eastern division, however, showed relatively the largest increase (11·3 per cent.) of any division of Scotland in the December, 1935, to February, 1936, quarter as compared with 1934-35, when Scotland had an increase of 7·2 per cent.

There was little change in the relative proportions of steers, heifers and cow-heifers certified in the United Kingdom in the autumn and winter of 1935-36 as compared with 1934-35. Table IV is a comparative statement of percentages.

Dead-Weight Certifications. The total number of animals certified at Dead-Weight Certification Centres in the six months 1935-36 was 23,865 compared with 16,914 in the

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-35

TABLE IV

	Steers		Heifers		Cow-Heifers	
	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35
	%	%	%	%	%	%
September	52.2	53.8	44.7	42.9	3.1	3.3
October	52.4	52.4	44.6	44.2	3.0	3.4
November	50.5	51.6	46.0	44.8	3.5	3.6
December	54.4	53.7	42.5	43.1	3.1	3.2
January	58.3	59.1	37.9	37.3	3.8	3.6
February	61.7	63.0	34.5	33.4	3.8	3.6

first six months of the scheme. Table V shows the comparative particulars for each country:

TABLE V

	England and Wales		Scotland		Great Britain	
	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35
September	3,343	1,828	663	345	4,006	2,173
October	3,336	2,474	968	623	4,304	3,097
November	3,419	2,199	1,012	616	4,431	2,815
TOTAL : September to November ..	10,098	6,501	2,643	1,584	12,741	8,085
December	2,297	1,803	525	415	2,822	2,218
January	3,553	2,950	827	631	4,380	3,581
February	3,233	2,684	689	346	3,922	3,030
TOTAL : December to February ..	9,083	7,437	2,041	1,392	11,124	8,829
Total for six months	19,181	13,938	4,684	2,976	23,865	16,914

The above figures show that certification on the dead-weight basis increased in the six months by over 41 per cent. as compared with 1934-35, and that the increase was relatively larger in Scotland, with a rise of 57½ per cent., than in England and Wales with a rise of 37½ per cent.

Average Weight of Fat Cattle. The average live-weight at which fat cattle were marketed over the whole of the United Kingdom in the six months, September, 1935, to February, 1936, was 9 cwt. 2 qr. 0 lb., which was 8 lb. lighter than the average in the first six months of the scheme. The

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average live-weight for each of the six months was—September, 1935, 9 cwt. 1 qr. 18 lb.; October, 9 cwt. 1 qr. 13 lb.; November, 9 cwt. 1 qr. 15 lb.; December, 9 cwt. 2 qr. 18 lb.; January, 1936, 9 cwt. 2 qr. 13 lb.; and February, 9 cwt. 2 qr. 5 lb. Each of these weights is 6 to 13 lb. less than the weight in the corresponding month a year earlier. From Table VI it will be seen that the cattle certified in Scotland in 1935-36 averaged 7 lb. heavier than in 1934-35, while cattle certified in England and Wales and Northern Ireland were lighter by 6 lb. and 21 lb. respectively.

TABLE VI

	Average weight over 3 months, September to November		Average weight over 3 months, December to February		Average weight over 6 months, September to February	
	1935	1934	1935-36	1934-35	1935-36	1934-35
	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.
England and Wales ..	9 1 16	9 1 23	9 2 20	9 2 24	9 2 4	9 2 10
Scotland ..	9 3 7	9 2 25	9 3 11	9 3 7	9 3 9	9 3 2
N. Ireland ..	8 1 19	8 2 12	8 1 22	8 2 16	8 1 21	8 2 14
United Kingdom ..	9 1 15	9 1 24	9 2 12	9 2 19	9 2 0	9 2 8

The dressed carcass weights of the animals certified at Dead-weight Certification Centres averaged 604 lb. in the six months, September, 1935, to February, 1936, as compared with 601 lb. in the first six months of the scheme. As Table VII shows, there was little change in England and Wales, but in Scotland the average carcass weight was 17 lb. heavier in 1935-36.

TABLE VII

	Average weight over 3 months, September to November		Average weight over 3 months, December to February		Average weight over 6 months, September to February	
	1935	1934	1935-36	1934-35	1935-36	1934-35
	lb.	lb.	lb.	lb.	lb.	lb.
England and Wales ..	593	596	602	599	597	598
Scotland ..	628	615	640	619	634	617
Great Britain	600	600	609	602	604	601

Average Prices of Fat Cattle. The average per live cwt. of fat cattle certified in the United Kingdom the six months, September, 1935, to February, 1936, was 3*d.* as compared with 35*s.* 7*d.* in the first six months of the scheme. It will be seen from Table VIII that the increase of 1*s.* 4*d.* per cwt. is attributable to the fall in prices in the first half of the period. Prices in the second half of the period maintain the prices of a year earlier, and, in February, 1936, prices were higher in all parts of the United Kingdom than in February, 1935.

TABLE VIII

	England & Wales		Scotland		Northern Ireland		United Kingdom	
	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35
	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>
Sept. ..	33 4	37 0	36 4	40 10	29 4	33 7	33 8	37 9
October ..	32 8	34 10	35 7	38 11	28 2	31 3	32 11	35 7
Novmbr.	32 5	33 9	36 6	38 8	27 7	30 1	32 9	34 7
3 months Sept. to Nov...	32 10	35 0	36 1	39 4	28 3	31 3	33 1	35 9
Dec. ..	35 0	35 5	38 2	39 7	28 10	30 10	35 3	36 0
January ..	35 2	35 2	38 0	39 0	30 9	31 3	35 5	35 10
February ..	35 3	33 10	37 5	37 2	31 11	30 10	35 5	34 4
3 months Dec. to Feb. ..	35 2	34 10	37 10	38 7	30 10	31 0	35 5	35 5
6 months Sept. to Feb. ..	34 0	34 11	37 0	38 11	29 7	31 1	34 3	35 7

Prices per cwt., dressed carcass weight, moved on similar lines, and although there was a reduction of 5*s.* 6*d.* in the three months, September to November, 1935, as compared with 1934, the margin was reduced to 1*s.* 5*d.* in the second period, with a price in February, 1936, higher than in February, 1935. Details of average prices per cwt., dressed carcass weight, are as follows:

	1935-36	1934-35
	<i>s.</i> <i>d.</i>	<i>s.</i> <i>d.</i>
September	60 6	67 3
October	58 11	65 0
November	57 11	62 9
3 months—		
September to November	59 2	64 8

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	1935-36	1934-35
	s. d.	s. d.
December	58 9	61 7
January	60 0	62 11
February	62 6	61 8
3 months—		
December to February	60 8	62 1
6 months—		
September to February	59 10	63 4

CROP ESTIMATION AND FORECASTING : INDICATIONS OF THE SAMPLING OBSERVATIONS ON WHEAT

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THE estimation of the yields of agricultural crops, and the forecasting of such yields before harvest, are problems of considerable importance in agriculture, especially since the introduction of a measure of control in agricultural production and marketing.

Both problems are intimately connected with the effects of weather on crop growth, for in many parts of the world the greater part of the variation from year to year in the total yield of a grain crop is due to variations in meteorological conditions. A knowledge of the relations between yield and meteorological conditions will therefore enable us, at least in many instances, to foretell the total yield of a district with fair accuracy some little time before the actual harvest.

On the other hand, it is not necessary to determine the relations between yield and meteorological conditions before attempting any forecasting, for forecasts may be based wholly or partly on observations of the growing crop, which itself serves as an integrator of past weather effects. The observations may be either quantitative, involving actual measurements of certain characteristics of the growing crop, or qualitative, involving only observations on the general appearance, earliness or lateness, etc. Such forecasts (or at least those involving quantitative measurements) are likely to be more accurate than forecasts based on meteorological conditions only, for they take into account all those influences, meteorological and other, which have manifested themselves in the growing crop up to the time of making the forecast. Forecasts based solely on qualitative measurements clearly depend on the skill of the forecaster, and their accuracy will vary from forecaster to forecaster.

There is, of course, a multiplicity of quantitative observations and measurements which can be made on a growing crop. The choice of those that are most suitable for forecasting can to a certain extent be determined by general

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considerations, but their relation to the final yields and the accuracy of the resultant forecasts can only be ascertained by the study of a series of such measurements on crops grown in a number of different places over a number of years.

The sampling observations on wheat, which form part of the Crop-Weather Scheme of the Agricultural Meteorological Committee,* will provide the first really adequate series of quantitative measurements of this type. The full scheme has as yet only been in operation for three years, so that there are scarcely enough observations to say very definitely how successful such forecasting is likely to be with wheat, but an examination of the results so far obtained does suggest that it may be possible to forecast the yield of wheat with considerable accuracy about six weeks before harvest, with only simple observations on the growing crop. The possible utility of such forecasting will be briefly referred to at the end of this paper; a full discussion is given by Irwin, in a paper presented to the Agricultural Section of the Conference of Empire Meteorologists in 1929.

The Sampling Process. The full scheme of sampling observations on wheat was commenced in the year 1932-33 at eight stations. Two further stations joined a year later. All except one are crop-weather stations at which full meteorological observations are made.

In their essentials the sampling observations are extremely simple. Counts of plant and shoot numbers and height measurements are made at intervals of from one to three weeks, from sowing to harvest, and in addition special observations are made for appearance above ground and the time of ear emergence.

From these measurements the whole growth-cycle of the crop can be determined. Summaries of the dates of the various stages of the crop's growth, and the quantitative measurements associated with them, have been published quarterly in this JOURNAL since the beginning of the scheme.

In order that the results of the various stations shall be strictly comparable and typical of wheat growing under agricultural conditions, a careful routine of observations has been evolved. It would manifestly be impossible to measure

* A joint committee of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland, the Meteorological Office and the Forestry Commission.

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and count all the shoots on even a moderate area, and even were it possible considerable damage to this area would result after a few sets of observations had been made. To avoid this difficulty a sampling technique has been adopted, observations being made on a set of random samples of the crop, freshly chosen at each time of observation. A similar sampling technique has been used to estimate the yields of ordinary commercial fields of wheat.

The essential feature of these sampling processes is a rigid procedure whereby the choice of samples is made to depend on some such random process as the drawing of a card or the use of a table of "random numbers," so that each element of the crop has an equal chance of being selected, and conscious or unconscious bias on the part of the observer is completely eliminated.

It must be admitted that the yields obtained on the experimental plots in the first three years have been remarkably high, and the sampling process has been criticized in some quarters for giving biased estimates. Some of the highest yields, however, have been closely substantiated by actual threshings of neighbouring plots. It is possible that in certain instances bias does exist, owing to the observer allowing some element of personal choice to influence the selection of the samples, but other factors that may account for these high yields must also be borne in mind: (a) the yields of total (not dressed) grain are given, (b) there are no losses due to carting, threshing or in the stack, (c) the best part of the field is likely to be chosen for the experimental plots, and (d) the last three years are generally admitted to have been good wheat years. There are also certain other minor factors tending in the same direction which need not be enumerated here. All that can be said with certainty is, that if the sampling process is properly carried out, biased yields cannot result, either on the experimental plots or the commercial fields, except from causes similar to those enumerated above.

Results of the First Three Years. The most remarkable fact that has emerged from the study of the results of the first three years of the sampling observations is the close connexion between the height of the shoots at ear emergence and the final yield of grain. Plant number at tillering is also negatively correlated with yield of grain. None of the other measurements on the growing crop appear to be closely

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associated with yield. From this limited set of results, also, it was not possible to detect any apparent effects of variation in meteorological conditions on yield, though the effect of the temperature on the growth of the crop was at certain stages clearly marked. The wheat crop, in fact, appears to be growing at or near the optimum meteorological conditions, so that the influences of variations in weather are likely to be small and complex, and to vary from soil type to soil type.

OBSERVED AND PREDICTED YIELDS (cwt. per acre).

Station	1932-33		1933-34		1934-35		Mean	
	Ob-served	Pre-dicted	Ob-served	Pre-dicted	Ob-served	Pre-dicted	Ob-served	Pre-dicted
Seale Hayne ..	19·0	25·5	32·4	30·0	26·2	26·2	25·9	27·3
Rothamsted ..	22·2	26·2	32·2	32·4	34·7	32·5	29·7	30·4
Newport ..	35·3	38·8	43·7	43·3	40·0	37·6	39·7	39·9
Boghall ..	32·8	35·3	35·7	37·8	29·6	26·4	32·7	33·2
Sprowston ..	25·3	30·6	28·3	29·5	20·6	23·3	24·7	27·8
Plumpton ..	—	—	35·2	28·2	47·2	39·4	39·4 ^s	33·6 ^s
Wye ..	10·8 ^t	—	47·8 ^s	41·5 ^s	15·2 ^s	24·2		
Long Sutton ..	27·6	29·3	—	—	10·8	—		
Mean ¹ ..	28·4 ²	31·6 ²	34·6	33·5	33·0	30·9		

(¹) Excluding Wye and Long Sutton.

(²) Adjusted to be comparable (over the same group of places) with the means of the other years, which include Plumpton.

(³) Adjusted to be comparable (over the same set of years) with the means of the other stations.

(⁴) Serious damage by birds.

(⁵) A defective sampling rod was used, and the yield and plant number already published in the JOURNAL have consequently been reduced by 4 per cent.

(⁶) Damaged by Take-all (*Ophiobolus graminis* Sacc).

The association between shoot height at ear emergence, plant number at tillering and yield of grain, enables a formula for the prediction of yield to be calculated. Working with the mean of the two standard varieties, and the first six stations of the accompanying table, it was found that for every increase of an inch in height (measured to the top of the sheath of the youngest leaf) an increase in yield of 1·32 cwt. per acre is to be expected, and that for every increase in plant number of 1 per foot-length of row, there is

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a decrease in yield of 0.62 cwt. With a height of 30 in. and a plant number of 10 per ft., the expected yield is 34.3 cwt.

The values of the yields calculated from the formula are shown in the table for comparison with the actual yields. Since the values of the constants of the formula are calculated from the observations themselves, it is, of course, to be expected that there will be some measure of agreement even though there is no real connexion. The mean yields of each station (for the three years) and the mean yields for each year (for the first six stations), however, do not enter into the calculation, except that the mean of all observed yields is equal to the mean of all the predicted yields. For this reason their agreement, and that of the yields of Wye and Long Sutton, is objective proof of the reliability of the formula. It will be seen that Plumpton has given yields greater than expectation, but that at the other stations the agreement is remarkably good. The observed mean yield for 1932-33 is lower than the predicted yield. It is probable that the greater care with which the experiments were carried out in the later years, with consequent reduction in bird damage, account for this discrepancy.

Possible Utility of the Sampling Technique. The above results, though not in themselves sufficiently extensive to prove with certainty the accuracy of such a simple method of forecasting as that based on height measurements, provide an indication that simple measurements of this type, if carried out on commercial crops, as described below, may enable quite accurate forecasts to be made. It remains to consider whether such a method, if it does prove to be practicable, is likely to be of value.

We do not wish to discuss this point at any length here, but it seems quite possible that such forecasts might prove a useful supplement to those at present provided by the Crop Reporters of the Ministry of Agriculture, since they could be made at an earlier date.

The technique of sampling may also provide a useful method of forming estimates of the yields of agricultural crops at harvest, instead of waiting until farmers have done a substantial part of their threshing or have marketed their produce. Such estimates might therefore also usefully supplement those of the Crop Reporters, since they should be available within a few weeks of harvest.

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Sampling from Commercial Farms. It is clear that the accurate prediction or estimation of the yields of a few experimental plots will be of little use in predicting or estimating the yield of the whole district, unless these yields are closely associated with those of other fields in the same district. In order to provide objective estimates of yields of commercial fields in the neighbourhood of the experimental plots, and of their variability, the crop-weather observers have, during the last two years, sampled for yield a certain number of fields belonging to farmers with whom they were acquainted. A very simple sampling technique was adopted, only about five square yards in all of any one field being sampled. This amount of sampling of a single field has proved amply sufficient when the purpose of the sampling is that of estimating the mean yield of a district, sampling errors being small in relation to the variability between fields.

The results of this sampling have shown that the variability from field to field in the same district was remarkably high. Indeed, in the season 1933-34 (the first in which this work was undertaken) there was no appreciable additional variability from district to district. In view of the fact that the districts experienced by no means identical weather conditions, this result can only indicate that influences other than those of the weather are responsible for a great part of the variation of the growing crop.

In view of this large variability in the yields of fields in a given district, it is not to be expected that the yields of the experimental crops should bear any close relation to the mean yield of a district. For this reason also, forecasting based only on the detailed study of a few experimental plots, though it may predict the yields of these plots with great exactitude, is not likely to be very successful in predicting the mean yield of a district. The role of the experimental plots is rather to indicate what are the most useful observations. The prediction of the average yield of a district can only be undertaken by taking measurements on commercial crops.

It should also be emphasized that such measurements would have to be taken for several years before forecasting of any kind could be attempted, for it may well be that a forecasting formula that gives a good result for the experimental plots, will require modification before it can be applied to commercial fields. To mention only one disturbing factor, differences in varieties will clearly introduce complications.

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Although in making forecasts and estimates of the mean yield of a district by the sampling method it might be ideal to select a number of fields at random, a fresh set being chosen each year, such a course would present considerable practical difficulties. A better plan, and one that would give results strictly comparable from year to year, would be to engage the co-operation of a sufficiently extensive panel of farms, initially selected as far as possible at random. Measurements could be taken on a pair of fields, properly selected at random from all the fields on the farm under the crop in question, and these could also be sampled for yield, allowance being made when combining such estimates for the area under the crop at each farm.

This course would especially commend itself, in that farmers would be familiar with the needs of crop estimators. Consequently, sampling could be carried out without friction, which would be likely to arise if powers of compulsory access were granted and only very occasional visits were paid to each farmer.

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Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for March, 1936, are given below, with comparative figures for February, 1936, and March, 1935. In February and March, 1936, the wholesale liquid-milk price was 1s. 5d. per gal., and in March, 1935, it was 1s. 4d. per gal.

Region	Pool Prices			Producer-Retailers' Contributions		
	Mar. 1936	Feb. 1936	Mar. 1935	Mar. 1936	Feb. 1936	Mar. 1935
Northern ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	13	3 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
North-Western ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	12 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
Eastern ..	13 $\frac{1}{2}$	13 $\frac{1}{2}$	13 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
East Midland ..	13	13 $\frac{1}{2}$	13	3 $\frac{1}{6}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
West Midland ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	12 $\frac{1}{2}$	3 $\frac{1}{6}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
North Wales ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	12 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
South Wales ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	13	3 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$
Southern ..	13 $\frac{1}{2}$	13 $\frac{1}{2}$	13 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{6}$	2 $\frac{1}{6}$
Mid-Western ..	12 $\frac{1}{2}$	13 $\frac{1}{2}$	12 $\frac{1}{2}$	3 $\frac{1}{6}$	3 $\frac{1}{6}$	3 $\frac{1}{6}$
Far-Western ..	12 $\frac{1}{2}$	13	12 $\frac{1}{2}$	3 $\frac{1}{6}$	3 $\frac{1}{6}$	3 $\frac{1}{6}$
South-Eastern ..	13 $\frac{1}{2}$	14	13 $\frac{1}{2}$	3 $\frac{1}{6}$	2 $\frac{1}{2}$	2 $\frac{1}{6}$
Unweighted Average	12'89	13'39	12'91	3'65	3'21	2'76

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal.

The number of accredited producers who received the premium was 15,350, and the sum required for the payment of the premium was raised by a levy of 0.331d. per gal. on all producers.

The inter-regional compensation levy was at 2 $\frac{1}{2}$ d. per gal. on liquid-milk sales, compared with 1 $\frac{3}{4}$ d. per gal. in March, 1935. A levy of $\frac{1}{4}$ d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:

	March 1936 (estimated) Gallons	March 1935 Gallons
Liquid	47,538,563	48,010,973
Manufacturing ..	26,511,974	24,202,669
	<hr/> 74,050,537 <hr/>	<hr/> 72,213,642 <hr/>

Percentage liquid sales :—64.2.

Percentage manufacturing sales :—35.8.

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The average realization price of manufacturing milk during March was 5·793*d.* per gal. compared with 6·23*d.* per gal. for March, 1935. The quantity of milk manufactured into cheese on farms was 629,414 gal. compared with 369,803 gal. in February and 286,899 gal. in March, 1935.

Potato Marketing Scheme. The Potato Marketing Board have co-opted Captain A. H. Maule Ramsay, M.P., as a special member to fill the vacancy caused by the resignation of Commander the Hon. A. D. Cochrane on his appointment as Governor of Burma.

Pigs and Bacon Marketing Schemes. *Pig Prices for April, 1936.* Contract prices for bacon pigs showed a further slight increase in April, the price for the basic pig (Class I, Grade C) being 11*s.* 7*d.* per score, compared with 11*s.* 5*d.* for March. The cost of the feeding-stuffs ration, which has not varied by more than 1½*d.* per cwt. in the last seven months, was 7*s.* 8*d.* per cwt. The ascertained bacon price rose from 90*s.* 3*d.* to 92*s.* 8*d.* per cwt., while the realization value of offals declined from 10*s.* 4*d.* to 10*s.* 1*d.* per pig.

Distribution of the 1935 Bonus Fund. The final distribution of the bonus fund for 1935, has now been completed and the following bonuses, including the interim payments already made, were paid to registered pig-producers who had qualified in respect of the year 1935:

Class A Bonus	..	..	8·7 <i>d.</i> per score
„ B „	..	..	5·8 <i>d.</i> „
„ C „	..	..	2·9 <i>d.</i> „

The total sum distributed was £121,500.

Pigs Marketing Board: Election of Special Members. Mr. C. M. Hallett and Captain G. Deakin were elected special members of the Pigs Marketing Board at the Annual General Meeting of registered pig-producers held on March 27, 1936. At the first subsequent meeting of the newly-constituted Board, Mr. J. A. Fox was re-elected Chairman and Captain E. T. Morris was elected Vice-Chairman of the Board.

Consumers' Committee for England. The Consumers' Committee for England have made a further report to the Minister regarding the operation of the Milk Marketing Scheme, 1933, from the point of view of consumers. This report supplements a previous report of the Committee made in February, 1935, and relates principally to the operation of

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the Milk Marketing Board's contract for the year ended September 30, 1935. The report reviews the general retail-price position and points out that retail prices in 1934-35 were generally about $\frac{1}{2}$ d. per quart higher than in the year immediately preceding the scheme. The Minister has referred the report to the Milk Reorganization Commission for Great Britain, to whom the former report was referred.

Bacon Import Regulation. The position with regard to supplies of bacon in the United Kingdom during the four months, May to August, 1936, has recently been under consideration and the quota for imports from foreign sources has now been fixed in the light of anticipated home and Dominion supplies during that period. The total foreign quota is at a rate about 5.0 per cent. higher than that which has been in operation, with very slight variations, since October last. The allocations to individual foreign countries are as follows:

Country.				Allocations
				May 1 to August 31, 1936 (a)
				Cwt.
Denmark	..	..	..	1,151,546
Netherlands	..	..	..	172,278
Poland	..	..	..	144,170
Sweden	..	..	..	85,232
Lithuania	..	..	..	53,497
Estonia	..	..	..	13,600
Finland	..	..	..	7,254
Latvia	..	..	..	12,695
U.S.S.R.	..	..	..	15,414
Argentina	..	..	..	12,695
U.S.A.	..	..	..	145,077
Allowance for imports from foreign countries not scheduled to the Bacon (Import Regulation) Orders..				43,875
Total				1,857,333

(a) Subject to amendment, in the case of certain countries, in respect of overshipments or undershipments in previous periods.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted, by April 15, to £6,032,111. These payments were in respect of 2,534,343 animals, the average payment per beast being £2 7s. 7d. Some 763,856 imported animals have been marked at ports (excluding Northern

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Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Milk Acts, 1934 and 1936: Manufacturing Milk. Advances made by the Ministry to April 15, 1936, in respect of milk manufactured during the financial years 1934-35 and 1935-36 are as follows:

Section		1934-5		1935-6	
		Gallons	Amount	Gallons	Amount
	<i>Milk Marketing Board for England and Wales—</i>		£		£
	In respect of milk :				
1	Manufactured at factories other than the Board's ..	152,998,244	998,544	186,189,992(a)	855,323
2	Manufactured by the Board ..	846,293	5,924	1,727,369(b)	6,926
3	Made into cheese on farms ..	18,424,801	113,074	11,351,199(c)	48,325
	Total for England & Wales	172,269,338	1,117,542	199,268,560	910,574
	<i>Government of Northern Ireland—</i>				
	In respect of milk :				
6	Manufactured into cream and butter at registered creameries	18,281,963	164,111	22,023,539(d)	124,743
	Total ..	190,551,301	1,281,653	221,292,099	1,035,317

(Gallage to end of (a) Feb., 1936. (b) Sept., 1935. (c) Dec., 1935. (d) Jan., 1936).

Increasing Demand for Milk. Exchequer contributions, up to April 15, towards the expenses of the Milk Marketing Board for England and Wales in carrying out approved arrangements for increasing the demand for milk, amount to £605,007.

Of this amount, £573,132 was paid in respect of the supply of milk to school-children at reduced rates, £750 towards the cost of the supplementary Nutrition Survey, and £31,125 in respect of general publicity.

Milk-in-Schools Scheme. Exchequer contributions now cover 16 months, and the following figures compare the gallonages consumed in the first four months and in the

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corresponding period of the second year. The figure for the latter period will be increased slightly when further returns are received.

	<i>Gallons</i>	<i>Exchequer Contribution</i>
Oct., 1934, to Jan., 1935 (inclusive)	8,362,470	
Feb. to Sept., 1935.. ..	14,467,036	
Total for 1st year ..	22,829,506	£401,642
Oct., 1935, to Jan., 1936 (inclusive)	7,483,209	
Total for 16 months ..	30,312,715	£573,132

General Publicity. A further scheme submitted by the Milk Marketing Board on the recommendation of the Advisory Committee on Milk Publicity, has been approved. It follows the lines of that successfully conducted during 1935. Of the total estimated cost of £60,000, the major portion will be devoted to a press and poster campaign covering the period February to November, 1936. The scheme was drawn up in consultation with the National Milk Publicity Council and its main activities will link up with the work of that Council.

Cheese-Milk Price. For the purpose of Exchequer advances in respect of milk used for manufacture, under the first three sections of the Milk Act, 1934, as amended by the Milk (Extension of Temporary Provisions) Act, 1936, the cheese-milk price has been certified by the Minister and by the Secretary of State for Scotland, to be 4·33 pence per lb. for the month of April, 1936.

Wheat Act, 1932: *Sales of Home-Grown Wheat—Cereal Year, 1935-36.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to April 3, 1936, cover sales of 27,549,915 cwt. of millable wheat, as compared with 28,718,212 cwt. in the corresponding period (to April 5, 1935) in the last cereal year.

Deficiency Payments. The Wheat Commission have announced that a third advance payment in respect of the cereal year 1935-36 will be made to registered growers who deliver proper applications on valid wheat certificates to the Commission on or before April 3. Payment will be made on or about April 25 and will be at the rate of 2s. 9d. per cwt. (12s. 4½d. per quarter of 504 lb.). No further payment will

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be made on these certificates until September, 1936, when any balance due will be paid. The Commission hope to make one further advance payment during the current cereal year at a date to be announced later.

Appointment of Member of Wheat Commission. Mr. Geoffrey K. Peto, C.B.E., has been appointed as a representative of consumers of flour, to fill the vacancy caused by the resignation of Sir Geoffrey Corbett, K.B.E., C.I.E.

Sugar-beet. The Sugar Industry (Reorganization) Bill received a third reading in the House of Commons on April 7, 1936.

Amalgamation of the Beet Sugar Manufacturing Companies. The White Paper (Cmd. 5139), which was published on March 26, 1936, is summarized on pages 141-145 of this issue of the JOURNAL.

National Mark Scheme for Caerphilly Cheese. In the autumn of 1935, the National Mark Caerphilly cheese scheme was introduced on a "self-grading" basis for an experimental period of one year. There are now eighteen Caerphilly cheesemakers authorized in the scheme.

When Caerphilly cheese bearing the National Mark first made its appearance on the Highbridge Market, the prices obtained were generally only slightly above the average market price. Makers and factors, however, showed interest in the scheme from the outset, and it was generally agreed that better results would follow if the grading were carried out by an independent grader appointed for the purpose. Accordingly, in December, 1935, a committee of farm and factory manufacturers was set up and officially recognized, for the purpose of appointing a grader of Caerphilly cheese and supervising the grading operations under the National Mark scheme. The change-over from "self-grading" to grading by the official grader, took place in February.

At about the same time, the Highbridge Market authorities arranged for National Mark cheese to be displayed separately in the market and improvement in the price levels of the marked product was at once recorded. Generally, the price margin in favour of National Mark cheese ranges from 3s. to 5s. per cwt. Recently, more than 50 per cent. of the total pitch at the market consisted of National Mark consignments. A substantial quantity is marketed through other channels.

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The Caerphilly Cheese Factors' Association, at a recent meeting, resolved that the scheme is of benefit to the Caerphilly cheese trade, and that the present methods of grading should be continued.

Proposed National Mark Scheme for Derby Cheese. Investigations are now being carried out which, it is hoped, will enable a National Mark scheme for Derby cheese to be introduced this year.

National Mark Beef. The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during January, February and March, 1935 and 1936, and the three weeks ended April 18, 1936 were as follows:

LONDON AREA				
				<i>Scotch sides for London</i>
				<i>Total</i>
January	1935	..	..	10,987
"	1936	..	..	12,528
February	1935	..	..	9,520
"	1936	..	..	9,080
March	1935	..	..	10,503
"	1936	..	..	11,353
Three weeks ended April 18,				
	1936	..	..	7,201

BIRKENHEAD AREA (including Liverpool)						
<i>For London included under Home-killed in London area</i>				<i>Liverpool for local requirements</i>	<i>Total</i>	
January	1935	..	..	2,431	1,659	4,090
"	1936	..	..	2,713	1,626	4,339
February	1935	..	..	2,037	1,486	3,523
"	1936	..	..	2,169	1,487	3,656
March	1935	..	..	2,384	1,355	3,739
"	1936	..	..	2,112	1,718	3,830
Three weeks ended April 18,						
	1936	..	..	861	4,202	2,063

BIRMINGHAM AND YORKSHIRE AREAS					
		<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
January	1935..	.. 5,386	2,493	1,764	489
"	1936..	.. 5,639	3,018	1,635	499
February	1935..	.. 4,845	2,180	1,624	427
"	1936..	.. 5,476	2,912	1,672	423
March	1935..	.. 5,143	2,459	1,575	460
"	1936..	.. 6,011	3,525	2,185	578
Three weeks ended April 18,					
	1936 3,779	2,190	1,241	364
					169

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The number of sides graded and marketed during January, February and March 1936, shows an appreciable increase over the corresponding period in 1935, the figures being 97,360 sides, and 87,406 sides.

Fat Stock : Carcass Sale by Grade and Dead Weight.

Insurance. The National Farmers' Union Mutual Insurance Company, Limited, has now made arrangements for the insurance policy, issued in connection with the above-mentioned scheme, to be amplified so as to cover the risk of non-payment for stock in the event of the purchaser's insolvency. Although stock to the value of about £600,000 has been handled without a single instance of non-payment, it is obviously desirable that producers should be safeguarded against this contingency. Costs and expenses incurred with the consent of the Company, in connection with proceedings leading up to insolvency, are also covered by the insurance. The new insurance will take effect in respect of all stock consigned under the scheme on and after May 1, 1936, at an additional premium of 6*d.* per head of cattle and 2*d.* per head of other classes of stock.

Extension of Scheme. Arrangements have recently been made for the Grade and Dead-Weight Scheme to be used for consignments from Scotland and Northern Ireland forwarded to the English centres. Purchases under this scheme are based on market requirements, and the use of the Scheme for stock which would otherwise be forwarded indiscriminately for sale on commission, will reduce the risk of dislocated markets and tend to maintain price-levels to the advantage of producers generally.

The Scheme is available for cattle, sheep and pigs, copies of a revised Marketing Leaflet (No. 75), embodying the three separate leaflets formerly issued, may be obtained, free of charge, on application to the Ministry.

Marketing Demonstrations at Agricultural Shows. The Ministry is arranging to exhibit at the following agricultural shows during the summer period :

Devon County—Exeter—May 20-22
Bath and West—Neath—May 27-30
Shropshire and West Midland—Shrewsbury—May 27-28
Three Counties—Worcester—June 9-11
Essex County—Saffron Walden—June 10-11
Royal Counties—Worthing—June 15-18
Royal Norfolk—Norwich—June 17-18

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Royal A.S.E.—Bristol—June 30—July 4
Aldershot—July 2-4
Great Yorkshire—Beverley—July 8-10
Kent County—Canterbury—July 8-10
Royal Welsh—Abergele—July 22-24
Royal Lancashire—Blackpool—July 30—August 3
Brewood and District—Brewood—August 3
Southport Flower Show—Southport—August 26-28
Sandy and District—Sandy—August 27
Altrincham—September 16

Working demonstrations of the testing and grading of eggs, tomatoes and other products to National Mark standards, will be staged at most of the shows; and, at the Three Counties, Royal, Great Yorkshire and Royal Lancashire Shows, live cattle, sheep and pigs will be exhibited to illustrate the various types of animal expected to yield carcasses of the grades defined under the Grade and Dead-Weight Scheme.

GERMANY : *Reorganization of the Sugar Market.*—Between 1931 and the end of 1934, the production and marketing of sugar were controlled by a compulsory cartel which succeeded in maintaining the price of sugar throughout the period of the crisis. This organization has now been replaced by a Central Association within the framework of the Reich Food Estate, and it follows the general lines of control established for other foodstuffs. The main reason for the change is that the policy of reducing stocks, initiated by the sugar cartel, has come to an end, and the sugar industry is now engaged in the re-establishment of minimum reserves.

Under the cartel regime, separate contracts were made between individual farmers and the factories to which they sold their beets. This system has now been replaced by a uniform contract, and by the allocation of beet quotas to individual farmers by the Central Association. The basic price for beet is fixed so as to guarantee a minimum return to the farmer. The system by which the price chargeable by the factories for their sugar is fixed, is also to be reformed. Previously, the basic sugar price was calculated with reference to quotations on the Magdeburg sugar market, and factories at a distance from Magdeburg were entitled to add freight surcharges. These local variations, which will be eliminated as far as possible, gave scope for profiteering by factories in the South and West of Germany which used locally-grown beets but charged the basic price plus freight surcharges for their sugar.

The Central Association will also deal with the problem of surplus refineries, a problem which has arisen owing to the cessation of exports and the tendency of sugar-beet factories to do more and more of their own refining.

It is hoped that beet growing will extend to Middle and East Germany and to the peasant area of South and West Germany. The present distribution (about 29,000 acres in Middle Germany, 180,000 in Silesia, 160,000 in N.-E. Germany, 106,000 in N.-W. Germany, 74,000 in the Rhineland and Westphalia and 64,000 in South Germany) does not correspond with the distribution of soil fit for beet or to the climatic and economic conditions of the industry. As a thorough-going reorganization of the land suitable for sugar beet would cause too much disturbance, the reorganization will be gradual. The Central Association aims at the rationalization of the industry at all its stages, and pending the full achievement of this aim, will

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require all factories to hold in store an obligatory reserve of 12 per cent. of the year's production to be at the disposal of the Central Association.

The receipts of the sugar-beet industry at the present price of sugar amount, at current rates of exchange, to between £50 and £55 million, of which about £27-£30 million go to agriculture and the balance to the factories. In the expectation that the sugar price would fall, an Equalization Reserve Stock of sugar has been established which, at present prices, is worth about £1.8 million. It is intended to use this Stock Fund for the encouragement of desirable forms of sugar consumption; about £1.5 million worth will be used for cheapening jam, so as to reduce the demand for fats, which have to be bought with foreign exchange, and about £125,000 worth will go to beekeepers so as to increase home-production of honey and render imports unnecessary. Encouragement will also be given to the utilization of sugar and sugar-beet for livestock feeding.

The Marketing and Storage of Bread Grains.—In order to assure adequate production and to facilitate marketing, the principle of the fixed price region has been maintained during the current season, and very little friction in the movement of grain supplies has been perceptible. The system of monthly price supplements has had the effect of creating a sounder system of storage on the part of traders and millers and has encouraged growers to hold grain off the market in their own barns. The stability in the supply and general market situation is also due largely to the system of assigning to each farm its "Food Supply" quota. To facilitate the distribution of these quota supplies to the markets, a quota mark has been introduced and this system has lightened the task of distribution by the trade.

The grain trade has succeeded in stabilizing the price of rye, as well as of bread, by means of funds secured from an equalization contribution.

The Government has extended to the current season its grant for the encouragement of the construction of grain store-houses, but the condition in regard to minimum capacity has been reduced to 300 short tons, with the object of giving local trading concerns and small millers an opportunity of building their own granaries. A further object is to encourage building in the producing regions, that is to say, the interior of the country. Previously, grain marketing was mainly concentrated in the harbours, and the independent granaries, as well as store-houses attached to the mills, were concentrated in the harbour marketing places, particularly on the coast and along the Rhine. With the development of the Reich Food Estate marketing regulations, the smaller mills, situated for the most part away from these harbour places, began to expand, and at the same time the foreign trade in grain declined. The decentralization and regionalization of grain marketing has been strengthened, and with it have arisen the necessity of maintaining an adequate reserve to equalize crop variations and a demand for storage accommodation.

MAY ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

THERE are several ways in which farmers characterize the months of the year—by the weather, nature of the work to be done, etc. Those farmers—and there are many of them—whose capital is only on the verge of sufficiency think of certain months as favourable or unfavourable in regard to the flow of revenue. Except on dairy farms, May is mostly a month when receipts are at a low ebb. On arable farms the grain has been sold, and the yards have been cleared of fattening cattle; on grass land, beef is nearly two months from maturity. Where store-cattle are raised, most of these have been sold by the end of April. Taking the country as a whole, the majority of fat lambs reach the markets after June. Although the wholesale price of milk is so low at this time of the year, the cheques come at a time when they are particularly welcome.

Sheep. With some mountain flocks, particularly in Scotland, lambing takes place in May. In the majority of flocks, however, lambing is practically over by the end of April, and the shepherd is busy in May, marking, castrating, and, in lowland flocks, shearing. One of the interesting points disclosed in the December voluntary census of live stock was the large number of lambs born in the latter half of the year—approximately half a million in England and Wales. This number would consist of the late mountain lambs, the autumn lambs in Dorset Horn Flocks, the out-of-season arrivals in both grass and mountain flocks, and a small number from very early lambing flocks; amongst out-of-season lambs in upland flocks one sometimes sees September lambs from shearlings that have taken the ram after returning from wintering. It is interesting to note that milk-fed lambs, marketed out of season, often do not realize the high prices anticipated for them. In London and possibly some of the other southern markets, “fancy” prices can be obtained for a certain number of young lambs in winter, but elsewhere there is no special demand for milk-fed lambs before Easter; this year, in North Wales for instance, a small

MAY ON THE FARM

number marketed in January, only realized about the same price per lb. as nine-months-old lambs.

In grass flocks maintained for fat lamb production, marketing begins this month, though the majority of the flocks do not provide substantial drafts until June. The higher prices at this time of the year encourage the selling of smaller lambs. These may realize as much as heavier lambs later, and their disposal mitigates the risk of "staining" the land. The highly productive pastures in some districts encourage heavy stocking with sheep. On a neighbouring farm, as many as five Welsh ewes and their lambs together with one yearling heifer can be maintained on an acre from the beginning of the grass season until the lambs are sold fat in July; the amount of staining that occurs on such pastures can readily be realized.

Cattle. A careful watch should be kept this month on the progress of fattening cattle. If there is poor growth of grass owing to dry or cold weather, the ration of concentrates should be increased. If the cattle do not thrive, many of them may not be ready before the heavy arrivals of grass beef in late August. Undecorticated cotton cake, maize, and flaked maize are popular at this time of the year, used alone or in mixtures. Again, the various "grass cakes" compounded by manufacturers are blended with particular reference to the needs of cattle on grass at this time of the year.

In spite of present marketing arrangements for milk, which removes the surplus milk problem from the shoulders of the individual producer, the production of veal is still popular, particularly at this time of the year. The best quality veal is obtained when calves are kept indoors and allowed to suck the cow twice a day. Butchers do not favour calves that have been pail-fed, nor "runners," that is, those that are allowed to run about with the cow. With veal, a white-coloured flesh is desirable, being more delicately flavoured than dark meat; to obtain this, a milk diet is necessary—additional food, such as grass, is not helpful. Dr. Hammond (*Scottish Journal of Agriculture*, January, 1936) states that the pale flesh can only be obtained by the absence of iron in the food, and by the prevention of exercise by close housing. A specialist contributor in *The Farmer's Weekly* recently stated that crosses with Channel Island breeds are unsuitable

MAY ON THE FARM

because of the difficulty of obtaining white flesh from these. The same contributor recommended the use of dried milk if pail feeding has to be resorted to, this resulting in a product of high quality. As regards weights, Dr. Hammond points out that veal is the only class of meat in which the value of the carcass per stone increases as the weight increases, and states that there should be an increased production of the better quality of veal from calves at 8-12 weeks old. Many calves are now slaughtered at a week old, particularly before the lamb season starts.

Horses. The better prices for horses give additional interest to the foals that may be seen this month. Breeding mares are a financial asset, in spite of progress in mechanization. In many instances they are worked right up to foaling, and the peak period of work on the land has passed before the respite given to them after foaling. Where heavy horses are bred and sold when five years old, there is no "depreciation" item in the cost of horse labour, and the cost per working day should not exceed 2s. 6d. to 3s., if the horses are kept fully occupied.

Cleaning Land. In planning the areas given to the respective root crops on the farm, land that is infested with couch, and has first to be cleaned, is left for late-sown crops like swedes and turnips. In western districts, where the climate favours long leys, couch grass is not a serious pest. The consolidation and close grazing of a 3-6 year ley suppresses this weed, and on many farms no operations are needed for dealing with it. The only places where couch may be seen on such farms, is in hedge banks, where it is favoured by the loose soil and absence of grazing.

The hoeing of potatoes, mangolds and beet, and the singling of the last two, are important operations this month. A Warwickshire farmer expressed the opinion last autumn that less hoeing would be necessary this year because the early completion of the corn harvest enabled the stubbles to be "chipped" or pared early, thus favouring the "chitting," or germination of a good proportion of weed seeds. In the north-western districts very few stubbles are chipped; the corn in normal years is not harvested until September, and by this time the season is too advanced for many of the weed seeds to germinate.

MAY ON THE FARM

In most of Anglesey and Caernarvonshire, root crops are singled, not by hoe but by hand—an operation that never fails to interest visiting farmers from other parts of the country. Singling in this way is done on hands and knees, the gaps are scooped by the hands and the plants singled at the same time. Many English farmers settling in these areas have made determined efforts to get their men to renounce this method in favour of the hoe, but have failed. It is probable that the stony nature of the soil is one reason for the unpopularity of the hoe in these counties.

Top Dressing. Kale, mangolds and beet should be top-dressed with a nitrogenous fertilizer this month, if such manuring is necessary. Nitrochalk is increasing in favour for such purpose, largely because it is convenient to apply and does not scorch the young leaves. If two doses are to be given, a first dressing of $\frac{3}{4}$ to 1 cwt. to the acre is sufficient in most instances. In the north-west, the response to nitrogenous manures is not as great as in the east and south. The ample supplies of farmyard manure, and the long grass leys with abundant wild white clover, go a long way towards solving the nitrogen problem.

Frost and Potatoes. The frost of May 16-17 last year was unusually late, and, in normal years, the fears of early potato growers regarding late frosts do not extend beyond April. Scottish growers claim that one particularly strong point in favour of *Epicure* is its power of recovery after the tops have been cut down by frost; one grower, in a recent conversation, recalled having had a good crop—though late—after the crop had been laid low three times by frost.

Much research work is in progress in Russia on the frost resistance of varieties of potatoes and of various species of the wild potato. While varieties and species differ little as regards the susceptibility of the tubers to frost, they differ in regard to the susceptibility of the tops. Thus, taking plants 25 days after the appearance of buds, *Epicure*, in one trial, lost 70 per cent. of the leaves when exposed for 11 hours just below freezing point, whereas *Solanum acaule*, a wild species, had only 9 per cent. of its foliage destroyed after being exposed to a temperature that was lower by 4°C. The object of experimenting with the wild species is to use them in breeding types of potatoes that will suffer but little damage from late spring and early autumn frosts.

MAY ON THE FARM

For Young Farmers. The treatment of cattle for warbles, as specified in the recent Order, will be completed for this year by the end of next month. Breeders and graziers should be thorough, in order to ensure that no flies are enabled to live to next year. In a large-scale trial, carried out on over 100 holdings in North Wales in 1930-32, one of the interesting facts that came to light was the effect of inefficient treatment. On two farms the treatment was not carried out in a satisfactory manner, live warbles being common fifteen days after treatment. Some of the fields on these farms were let for grazing, and, to quote Dr. M. Davies (this JOURNAL, December, 1932) "it was remarkable how, when infested cattle were found among clean cattle on adjacent farms, inquiry showed that these had been grazing on the unsatisfactory holdings."

It is important to realize that compulsory measures in themselves are not sufficient for complete eradication of diseases and pests of animals; the ready co-operation of stock owners is essential for complete success. There can be little doubt that Sheep Scab would have been eradicated years ago had all flockmasters complied with the regulations in letter and in spirit. In New Zealand, where this affliction has been stamped out, flockowners were allowed up to a certain date to clear the mountains of sheep, and then soldiers were sent out with orders to shoot any sheep still at large. If all our flockowners made sure that not a single animal escaped the dip, and that each animal was properly dipped, similar success would follow in this country.

The Derbyshire Flockowners Association provides an example of what can be done in this respect, since by assisting the police in dipping arrangements, they have obviated any likelihood of odd sheep escaping being dipped. It was officially reported that, at a recent organized gathering of 12,000 sheep, the property of 198 owners, no case of Scab was found.

In many instances a change of attitude is essential on the part of stockowners, and to bring this about merits the attention of Young Farmers' Organizations in this country. The enthusiasm and determination of some of the younger generation in a neighbourhood could not fail to exert a great influence in helping these Orders to achieve quick and complete success.

NOTES ON MANURING

J. A. SCOTT WATSON, M.A.,

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Plant Hormones. Increasingly frequent references are being made in agricultural writings to substances that are variously called plant hormones, phyto-hormones, auxins, auximones, etc., and occasionally the suggestion is made that these may have important uses in agriculture and in gardening.

It is well known that, in the animal, growth and certain of the vital functions depend on the presence in the body of small quantities of particular organic substances, usually of rather complex chemical composition. If a given substance is normally manufactured inside the animal body, for example in one of the ductless glands, it is called a *hormone*. Particular animals may, of course, fail to produce a particular hormone, in which case the dependent vital function will break down. In such a case the appropriate hormone, obtained from the gland of another animal, may be supplied, and normal health thus restored. A familiar example is the use of insulin, obtained from a particular part of the pancreas, in controlling diabetes.

If the substance in question is not manufactured by the animal itself, but must be supplied in the food, it is called a vitamin. Vitamin-deficiency diseases, such as rickets, pellagra, beri-beri, scurvy, etc., have been fairly common in man, and can occur in farm animals when these are fed on rather highly "artificial" diets. The use of cod-liver oil as a source of Vitamins A and D is now familiar to stock feeders.

The suggestion now is that there is a parallel set of substances related in the same sort of way to the health and growth of the plant. The early work on the subject was mostly done by the late Professor F. W. Went of Utrecht, and has been carried on there by F. Kogl and his associates. A good many research-workers in other places have now, however, been attracted to the problem.

Let us take two of the best-known examples of the action of these substances. It used to be said that yeasts could be grown in a medium consisting of fermentable sugar, mineral salts and ammonium compounds. This, indeed, is true of the commoner wild yeasts; but if a pure culture of a good brewers' yeast be used in the experiment, the growth is very

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poor. If a small amount of an extract, which has been called *Bios*, is added, the growth rate of the yeast is increased by as much as 700 per cent. *Bios* appears to consist of more than one chemical substance. It is present in largest quantities, so far as is known, in egg yolk. The action is broadly parallel to that of Vitamin A in relation to animal growth.

The Utrecht experiments have dealt with higher plants. It has been shown that the length-wise growth of plant cells, for example in the oat sprout, depends on the presence of auxins that are produced at the tip of the sprout. If the tip is removed a deficiency condition arises and the growth is interrupted for a number of hours; but if the tip is replaced by a small block of jelly containing the growth substance, then growth continues. If the jelly touches only one side of the cut portion then the sprout grows on one side only, and bends over as a result. Two separate but related chemical substances, both producing this effect, have been isolated from the oat; these have been called respectively Auxin *a* and Auxin *b*. The chemical constitution has been worked out in each case, and is not very complex—a matter of eighteen carbon atoms, partly in a chain and partly in a ring, with various hydrogen and oxygen atoms tacked on.

Another substance, with an entirely different chemical constitution (it is an indole derivation) and meantime called hetero-auxin, produces the same sort of result, but is more potent. It has been isolated from yeast and from urine, as well as from higher plants, and has also been synthesized chemically. A number of related indole compounds (indolyl acids) have been tried on plants, and several have been found to be active. These substances can be taken up by plants from solutions, the strength of solutions that have been used being of the order of one part in 100,000 of water. They may also be applied locally to the plant, mixed in lanolin. Their effect is to accelerate growth and to encourage the rapid formation of new organs. For instance, if the lanolin mixture is applied to the stem of a tomato the stem produces a growth of roots in about five days.

Very many more experiments will be necessary before practical use can be made of these substances. It seems quite possible that they will be found useful by the horticulturist in propagation work—e.g., in inducing the rapid striking of cuttings. It may also be that the treatment of seed with phytohormones will be found to accelerate germination and

NOTES ON MANURING

the early growth of the seedling, which is often desirable. It seems yet too early, however, even to speculate about the general use of the substances in conjunction with ordinary fertilizers. On the whole then, plant hormones have future possibilities; but the farmer, so far as we can see, need not trouble himself about them yet awhile.

Chocolate Spot in Beans. This disease of beans, which has in recent years been a frequent cause of heavy losses, has been the subject of a good deal of controversy among plant pathologists. It now seems that the primary cause of the trouble is a fungus of the genus *Botrytis*, though it is also possible that two or three different conditions have been confused under one name. The disease takes on an epidemic character only under very wet weather conditions, but another predisposing cause of it, in certain cases at least, is a shortage of potash. Good results, making the difference between a very severe and a very mild attack, have been obtained by applying a dressing of $1\frac{1}{2}$ cwt. per acre of muriate of potash or an equivalent amount of potash in the form of one of the other salts. The results are at least encouraging enough to justify trials in areas where the incidence of the disease is serious.

Nitrogen for Marrowstem Kale. It is generally realized by farmers that the kales are "gross feeders" and are, in particular, able to make use of much larger dressings of nitrogen than the general run of agricultural crops. A series of experiments has been conducted at Jealotts Hill over the past six years on the profitability of different applications of nitrochalk, running, in certain cases, up to as much as 15 cwt. per acre. In most years all plots had dung and mineral manures (4 cwt. superphosphate and 2 cwt. muriate of potash), and where these manures were not supplemented with nitrogen the average yield was of the order of 10 or 11 tons per acre. Where 3 cwt. of nitrochalk were added the yield was raised to 15 or 16 tons. Doubling the nitrochalk to 6 cwt. per acre gave over 20 tons of crop. Up to this level, therefore, each hundredweight of nitrochalk produced an increase of roughly $1\frac{1}{2}$ tons of kale. In some of the trials a dressing of 9 cwt. seemed to show a still higher profit. Other trials elsewhere have told much the same story. It is, indeed, not known whether the feeding value of the crop is equally high when it has been heavily dosed with nitrogen. One would

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expect a lower percentage of dry matter after the heavy manuring. On the other hand, the large, leafy plant, grown with abundant nitrogen, may have the lower fibre content, and may, therefore, be both more palatable and more fully digestible. It would, however, be well that, in future trials, the moisture- and fibre-contents of the crop should be determined.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended April 15.				
	Bristol	Hull	L'pool	London	Cost per Unit at London
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d.	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:					
Neutral (N. 20·6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium Cyanamide (N. 20·6%)	7 5e	7 5e	7 5e	7 5e	7 0
Kainite (Pot 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	4 18	4 15	4 13	4 15	3 2
" " (Pot. 20%) ..	3 15	3 12	3 10	3 12	3 7
Muriate of Potash (Pot. 50%)	7 18	7 16	7 12	7 16	3 1
Sulphate " (Pot. 48%) ..	9 8	9 6	9 2	9 6	3 10
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
" (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3¼% P.A. 20½%)	..	6 17	6 5h	6 0	..
Steamed Bone Flour (N. ¼% P.A. 27½—29½%) ..	5 12	5 10	5 2h	5 2	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid;

S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 3s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

NOTES ON FEEDING

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Feeding Standards. From the earliest days of the scientific study of farm feeding problems, efforts have been made to arrive at "standards" that would serve as guides to the most efficient adaptation of food supply to the needs of the animal. Apart from the Scandinavian "standards," which are based entirely upon practical feeding experiments and take little or no account of the variable composition of foods, "standards" in use in most other countries are drawn up in terms of the amounts of digestible nutrients estimated to be required for various feeding purposes. The classic example of this type is the Wolff table of "standards," which throughout the latter half of last century was almost universally employed as the basis of attempts at the scientific control of feeding. In this table the requirements were set out for each class of animal in terms of the amounts of digestible protein, oil, carbohydrates and fibre required per 1,000 lb. live-weight. Tables of this type are still used by many American agricultural advisers, but for reasons indicated in last month's Notes they have been superseded in this country and in Germany by Kellner's table, in which the general food requirements are summarized in the one figure of the Production Starch Equivalent, supplemented by a statement of the amount of Digestible Protein that should be included therein. It is customary, also, to give a figure for Total Dry Matter, as a rough guide to the degree of bulkiness that is desirable in the ration.

In America similar tables are also in use, with the difference that the general requirements are stated in units of "net energy" instead of starch equivalent. The difference is one of detail only, since both methods state the general energy requirement of the animal, in the one instance in starch units, in the other in energy units.

Clearly, therefore, our "standards" take account only of energy and protein requirements, and in using them we must not lose sight of the fact that their validity depends upon the maintenance of satisfactory conditions with regard to all the other factors that determine success in feeding, such as the

NOTES ON FEEDING

supply of minerals and vitamins, efficient management, the conditions of housing and other environmental factors.

Further, we must keep in mind the great possibilities of variation between individual animals, making it inevitable that our "standard" for any class of stock can at best be no more than a guide to the *average* requirements, and as such requiring adjustment according to our conception of the average. This may vary, for example, according to the breed of the animal. The standard we commonly use for the Shorthorn cow is hardly likely to be applicable to the Jersey or Kerry. As an illustration of the difference that may exist even between individuals of the same breed, the maintenance requirements (per 1,000 lb. live-weight) of two Jersey cows were found in American experiments to differ by over 30 per cent. The difference reflected the general temperaments of the cows, the one with the lower requirement being very quiet and lying down for long periods, whilst the other was far more restless.

The term "standard" must obviously, therefore, not be interpreted as being something fixed and immutable, but should be regarded simply as a useful starting-point in our rationing control, from which we must be prepared to make variations, up or down, according to our experience with the particular set of animals to which it is applied. In comparing rations with the "standard," a tolerance of 10 per cent. is probably well within the limits of validity of the "standard" with which the ration is intended to conform, especially having in mind that, as a rule, in practice, no information is available as to the precise composition and digestibility of the foods to be used.

Maintenance Requirements. In drawing up a feeding standard it is customary to assess separately the requirements for maintenance and production. This is done on grounds of convenience and is not intended to imply any sharp discrimination by the animal in the use it makes of the various feeding-stuffs included in the ration; each probably contributes to both maintenance and production, though in different proportions. The distinction between maintenance and production makes it easier, however, for us to adjust our standards to different sizes of animal and different levels of production.

The first essential, therefore, for arriving at a "standard,"

NOTES ON FEEDING

is accurate knowledge of the basic requirements of the animal for maintenance, which represent the first charge to be met by the food before the needs of production can be supplied.

Reduced to its simplest terms, the maintenance requirement is measured by the energy necessary to maintain the body temperature constant, to make good wear and tear, and to provide for the "internal work" of the body. The heat requirement is affected by the external temperature if this should be below a certain point, the "critical temperature," which varies with different classes of animal. The "internal work" comprises not only the normal work of such organs as the heart and lungs, but also the work involved in masticating and digesting the food. It also includes muscular exertion of any other kind, voluntary or involuntary, which will be greater when the animal is standing up than when lying down, and also when awake than when asleep. The energy used in all these various ways is eventually transformed into heat, so that under maintenance conditions the amount of heat lost by the animal during a given time, is a measure of its "maintenance requirement" for that period.

From the foregoing, it will be seen that the maintenance requirement reaches its absolute minimum when the animal is completely starved (no work of digestion), lying down, and asleep (minimum muscular exertion). This minimum requirement is termed the "basal metabolism" of the animal and is usually expressed in terms of energy units (calories) lost per unit of body surface in a given time.

For farm practice, the basal metabolism figure is clearly only of scientific interest, since on the farm the animal is continuously digesting food and can only spend a part of its time lying down and asleep. The "maintenance requirement" for practical purposes must therefore be assessed at a level appreciably higher than the basal metabolism, and the real difficulty in fixing the standard lies in the assessment of this difference. Data are available to guide us as to the extra requirements for standing as against lying down, and for wakeful periods of rest as compared with periods of sleep, so that if our animals are tied up in stalls, we can form a fairly reliable estimate of their practical maintenance requirements as compared with the basal metabolism for which we have relatively accurate data.

Considering the animal that is not so restricted in its movements, however, we are clearly faced with a greater difficulty,

NOTES ON FEEDING

owing to the wide variety of practical conditions, ranging from the feeding yard or pen to unrestricted pasturage.

With animals at grass, the quality of the pasture will also be a determining factor, since the animal is likely to spend more time on its legs and travel a greater distance to get its food on a poor pasture, than on a good pasture.

On the point of the amount of energy expended by grazing stock on open range, some interesting observations have been made in Texas. It was found that cattle spent 10 per cent. of the day-time in travel, sheep 13 per cent. and goats 19 per cent. Cattle travelled an average of 3.3 miles, sheep 3.8 miles, and goats 6 miles. Cattle averaged 12.5 per cent. of their day resting, sheep and goats about 15 per cent. Standing, as distinct from travel, accounted for about 20 per cent. of the day with each group.

As indicated above, the basal metabolism varies in proportion to the amount of body surface exposed by the animal, but the further requirements that go to form the practical maintenance standard probably vary more nearly in proportion to the weight of the body. These further requirements are relatively small, however, in comparison with the basal metabolism, so that no serious error is involved in assuming, as one commonly does, that the practical maintenance requirement varies similarly with the amount of body surface.

In practice, the live-weight is a more convenient basis than body surface on which to assess the variation of maintenance requirement with varying size of the animal, and for this purpose it is usually assumed that body surface, and therefore the maintenance requirement, varies as the two-thirds power (square of the cube root) of the live-weight. Other ratios differing slightly from this have been suggested from time to time, on the basis of measurements of groups of animals, but the "two-thirds power" rule is most generally used.

The practical effect of the rule is that the maintenance requirement per 1,000 lb. live-weight tends to fall as the live-weight of the individual animal rises, and to rise as live-weight falls. For example, ten cattle each of 9 cwt. live-weight require together more food for maintenance than nine, each of 10 cwt. live-weight, although the total live-weight to be "maintained," 90 cwt., is the same in each instance.

The rule is probably fairly reliable with adult animals of the same class, where the range of variation in individual weights is not very large. Its validity for young, growing

NOTES ON FEEDING

animals would appear to be doubtful, especially where, as with pigs, the changes in live-weight are very rapid.

Another factor that influences the maintenance requirement in practice is the "condition" of the animal, the requirement (per 1,000 lb. live-weight) tending to rise as the animal passes from poor into good condition. This is indicated by the common experience of feeders that a fat animal needs more food to prevent loss of live-weight than a lean animal of the same weight. This point has also been verified in American experiments in which the maintenance requirements of two Aberdeen-Angus steers were measured at various levels of food-supply ranging from starvation to double the maintenance ration. As the food supply was raised from zero up to half of the maintenance requirement little increase took place in the heat production (and therefore in the maintenance requirement) but from this point onwards the maintenance requirement (per 1,000 lb. live-weight) gradually rose until the food supply reached the maintenance level, and then rose further at a more rapid rate as the food supply was increased beyond this point.

Towards this extra maintenance requirement at the higher levels of feeding some contribution is made, however, by the heat coming from the food given in excess of the maintenance requirement. The specific provision for maintenance in a heavy ration may thus actually be lower than with light rations.

In the light of the various considerations that have been outlined it is evident that in giving a "standard" for the maintenance requirement of a particular class of animal we should indicate the conditions to which it is intended to apply. For the standards in common use the implied conditions are that the standards are intended to apply to the average animal in store condition and on store rations, protected from undue exposure and allowed not more than the amount of exercise desirable in the interests of health. Where these conditions do not obtain some adjustment must be made, the nature and extent of which must be left to the discretion of the rationer.

The foregoing discussion has dealt only with the energy requirements for maintenance. The subject of protein requirements must be reserved for discussion later, along with the closely allied problem of the protein requirements for production.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	5 9
Maize	78	7.6	4 15
Decorticated ground-nut cake	73	41.3	7 1
„ cotton-seed cake	68	34.7	7 0
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1.37 shillings, and per unit protein equivalent, 1.41 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9.6	5 12
Oats	60	7.6	4 13
Barley	71	6.2	5 6
Potatoes	18	0.8	1 6
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 10
Beans	66	19.7	5 18
Good meadow hay	37	4.6	2 17
Good oat straw	20	0.9	1 9
Good clover hay	38	7.0	3 2
Vetch and oat silage.. ..	13	1.6	1 0
Barley straw	23	0.7	1 12
Wheat straw	13	0.1	0 18
Bean straw.. ..	23	1.7	1 14

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per roo lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British ..	6 5	0 8	5 17	72	1 7	0·85	9·6
Barley, British feeding	5 10	0 8	5 2	71	1 5	0·76	6·2
„ Persian ..	5 3*	0 8	4 15	71	1 4	0·71	6·2
„ Polish ..	5 12	0 8	5 4	71	1 6	0·80	6·2
„ Russian ..	5 12	0 8	5 4	71	1 6	0·80	6·2
Oats, English, white ..	6 7	0 9	5 18	60	2 0	1·07	7·6
„ „ black and „ „ grey ..	6 3	0 9	5 14	60	1 11	1·03	7·6
„ Scotch, white ..	6 12	0 9	6 3	60	2 1	1·12	7·6
„ Canadian, No. 3 „ Western ..	6 3†	0 9	5 14	60	1 11	1·03	7·6
„ Canadian, mixed feed	5 10†	0 9	5 1	60	1 8	0·89	7·6
Maize, Argentine ..	4 15	0 7	4 8	78	1 2	0·62	7·6
„ Danubian Gal. Fox „ South African, No. 2 White Flat	4 10†	0 7	4 3	78	1 1	0·58	7·6
Beans, English, Winter	4 17†	0 7	4 10	78	1 2	0·62	7·6
Peas, English, blue ..	5 10§	0 17	4 13	66	1 5	0·76	19·7
„ Japanese ..	9 0§	0 15	8 5	69	2 5	1·29	18·1
Dari ..	18 10†	0 15	17 15	69	5 2	2·77	18·1
Milling Offals :—	6 12†	0 8	6 4	74	1 8	0·89	7·2
„ Bran, British ..	5 10	0 15	4 15	43	2 3	1·21	9·9
„ broad ..	6 7	0 15	5 12	43	2 7	1·38	10
„ Middlings, fine, imported ..	5 10	0 13	4 17	69	1 5	0·76	12·1
„ Weatings† ..	5 12	0 14	4 18	56	1 9	0·94	10·7
„ „ Superfine† ..	6 5	0 13	5 12	69	1 7	0·85	12·1
„ Pollards, imported ..	5 0	0 14	4 6	50	1 9	0·94	11
„ Meal, barley ..	7 0	0 8	6 12	71	1 10	0·98	6·2
„ „ grade II	6 5	0 8	5 17	71	1 8	0·89	6·2
„ „ maize ..	5 5	0 7	4 18	78	1 3	0·67	7·6
„ „ South African	4 17	0 7	4 10	78	1 2	0·62	7·6
„ „ germ ..	5 5	0 11	4 14	84	1 1	0·58	10·3
„ „ locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
„ „ bean ..	8 0	0 17	7 3	66	2 2	1·16	19·7
„ „ fish (white) ..	13 5	2 2	11 3	59	3 9	2·01	53
„ Maize, cooked, flaked ..	5 15	0 7	5 8	84	1 3	0·67	9·2
„ „ gluten feed ..	5 7	0 13	4 14	76	1 3	0·67	19·2
„ Linseed cake—							
„ English, 12% oil ..	7 17	1 0	6 17	74	1 10	0·98	24·6
„ „ 9% „ ..	7 7	1 0	6 7	74	1 9	0·94	24·6
„ „ 8% „ ..	7 2	1 0	6 2	74	1 8	0·89	24·6
„ „ 6% „ ..	7 12§	1 0	6 12	74	1 9	0·94	24·6
„ Soya-bean cake, 5½% oil	8 7§	1 8	6 19	69	2 0	1·07	36·9
„ Cottonseed cake, English, Egyptian seed, 4½% oil ..	4 15	0 18	3 17	42	1 10	0·98	17·3
„ Cottonseed cake, Egyptian 4½% oil ..	4 7	0 18	3 9	42	1 8	0·89	17·3

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Cottonseed cake, decorticated, 7% oil..	7 0†	1 8	5 12	68	1 8	0·89	34·7
Cottonseed, meal, decorticated, 7% oil..	7 5†	1 8	5 17	70	1 8	0·89	36·8
Coconut cake, 6% oil..	6 2	0 18	5 4	77	1 4	0·71	16·4
Ground-nut cake, 6-7% oil	5 15*	0 18	4 17	57	1 8	0·89	27·3
Ground - nut cake, decorticated, 6-7% oil	7 5	1 8	5 17	73	1 7	0·85	41·3
Ground - nut cake, imported, decorti- cated, 6-7% oil ..	6 17	1 8	5 9	73	1 6	0·80	41·3
Palm-kernel cake, 4½-5½% oil	6 5†	0 12	5 13	73	1 7	0·85	16·9
Palm-kernel cake meal, 4½% oil	6 2†	0 12	5 10	73	1 6	0·80	16·9
Palm-kernel meal, 1-2% oil	5 7	0 12	4 15	71	1 4	0·71	16·5
Feeding treacle ..	4 12	0 8	4 4	51	1 8	0·89	2·7
Brewers' grains, dried ale	4 17	0 11	4 6	48	1 9	0·94	12·5
Brewers' grains, dried porter	4 10	0 11	3 19	48	1 8	0·89	12·5
Dried sugar - beet pulp (a)	5 7	0 5	5 2	66	1 7	0·85	5·2

(a) Carriage paid in 5 lots. * At Bristol. § At Hull. † At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of March, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £9 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £8. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N., 7s. 3d.; P₂O₅, 2s. 3d.; K₂O, 3s. 5d.

MISCELLANEOUS NOTES

International Federation of the Agricultural Press.

Following resolutions approved by the International Congress of the Agricultural Press held at Brussels last July, an International Federation of the Agricultural Press has been established with headquarters in Rome. The objects of the Federation are the promotion of friendly relations between the members, the safeguarding of their interests, and the obtaining for them of various advantages. The principal means adopted will be the publication of a monthly *International Bulletin* in French, English, German and Spanish or Italian; the provision of a service to furnish members with summaries or full translations of original articles; the circulation of the review, *La Technique Agricole Internationale*, etc. Full particulars may be obtained on application to The Secretary, 86, Via Regina Elena, Rome.

International Peasant Life Exhibition, Vienna, 1936

AN International Exhibition illustrating Peasant Life will be held, in connexion with the Vienna Fair, in the Rotunde Buildings, Vienna, from August 6 to September 13 next. The Organizers are anxious that Great Britain should be represented; and, among other appropriate exhibits, desire to secure models of a Welsh or Irish peasant house; also of a small holding of the modern type, illustrating the back-to-the-land movement. Further particulars may be obtained from the Paneuropa Union Österreich, Wein, Hofburg, Austria.

The Agricultural Index Number

THE general index number of prices of agricultural produce for March, viz. :—116 (base 1911-13=100) was 2 points lower than in February, but 4 points above the figure recorded a year ago. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the month is 122.) Average prices for store cattle, fat pigs and cheese advanced during the period under review, whereas grain, fat cattle, eggs, potatoes and hay showed reductions.

MISCELLANEOUS NOTES

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	—
May	122	115	102	112	111	—
June	123	111	100	110	111	—
July	121	106	101	114	114	—
August	121	105	105	119	113	—
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Grain. The average for wheat at 6s. 3d. per cwt. was lower by 1d. than in February, and the index declined from 85 to 84. (If the "deficiency payments" under the Wheat Act, 1932, be taken into account the figure is 125.) The current average for wheat is, however, 1s. 8d. per cwt. more than a year ago, the index then being 62. Barley, at an average of 7s. 7d. per cwt., and oats, at 5s. 11d. per cwt., were also reduced in price, the former by 4d. and the latter by 1d., the respective indices moving downwards from 98 to 96 and 85 to 84. In March, 1935, barley averaged 7s. 6d. per cwt., and oats 6s. 10d., and the indices stood at 95 and 96 respectively.

Live Stock. Quotations for fat cattle were fairly steady during March, and the average for second quality of 32s. 8d. per live cwt. was only 4d. lower than that for the preceding month, although, owing to a reverse movement in the base period, the index at 93 shows a fall of 3 points. Price and index alike show advances on those of March, 1935, by 1s. 9d. and 5 points respectively. The effect of adding the cattle subsidy raises the latest index to 107. Fat sheep were again unaltered in value at 9½d. per lb. for second quality, but by reason of a rise in the base years a decline of 4 points in the index to 115 was recorded. Baconers at 11s. 3d. per score and porkers at 12s. 4d. appreciated by 5d. and 3d. respectively, the relative indices moving upwards from 111 to 112 and 114 to 117. Average prices for dairy cows were lower by 17s. per head than in February, but those for store cattle advanced by 5s. per head. Similar movements having taken place during 1911-13 the indices showed little change. Store

MISCELLANEOUS NOTES

sheep and pigs were slightly dearer, but, with contrary movements in the base period, the index numbers declined.

Dairy and Poultry Produce. No change took place in the regional contract prices for milk. Butter was firm in value, but, owing to a downward movement between base prices, the index moved from 93 to 95. Cheese rose by 2s. 6d. per cwt., the index appreciating by 2 points to 97, while a reduction of 4½d. per dozen in the price of eggs was reflected in the index, which fell by 9 points to 109. The combined index for poultry at 120 was 2 points lower than in February.

Other Commodities. Quotations for potatoes declined on the average by 2s. 6d. per ton from those of March, as against a rise of 1s. 6d. during the base period, and, as a consequence, the index at 193 showed a drop of 7 points, but is still much higher than a year ago. Both clover and meadow hay were reduced in value and the combined index moved downwards from 83 to 81. At 1s. 0½d. per lb. wool was slightly higher in price than in February, but, owing to a proportional increase in the base years, the index of 96 was maintained at the same level.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935		1936		
	Mar.	Mar.	Dec.	Jan.	Feb.	Mar.
Wheat	58	62	77	85	85	84
Barley	111	95	100	101	98	96
Oats	87	96	83	87	85	84
Fat cattle	99	88	91	97	96	93
„ sheep	118	139	119	127	119	115
Bacon pigs	127	114	98	107	111	112
Pork „	131	120	110	115	114	117
Dairy cows	101	101	104	105	103	102
Store cattle	86	86	92	94	92	92
„ sheep	91	113	106	105	104	102
„ pigs	143	130	131	134	129	123
Eggs	89	94	110	115	118	109
Poultry	126	124	120	127	122	120
Milk	141	161	171	171	171	171
Butter	84	88	93	93	93	95
Cheese	116	91	87	93	95	97
Potatoes	97	108	185	201	200	193
Hay	81	103	84	83	83	81
Wool	98	83	91	96	96	96

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Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	128*	117*	127	126*	125	125
Fat Cattle	—	102	105	111	110	107
General Index	112*	119	121	124*	123	122

* Superseding figures previously published.

Agricultural Research Scholarships and Studentships for Research in Animal Health

THE Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland invite applications for the following *post-graduate* Agricultural Research Scholarships and Studentships for Research in Animal Health, tenable as from October 1, 1936, for a period not exceeding three years:—

- (1) Not more than three Agricultural Research Scholarships, each of the value of £200 per annum, to which will be added, if necessary, a sum not exceeding £50 per annum for fees and expenses.
- (2) Not more than three Studentships for Research in Animal Health, each of an *inclusive* value not exceeding £300 per annum.

Applications must be received not later than May 31, 1936. Nomination forms and further particulars may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1., or from the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh 2, according to the country in which the candidate resides.

The Reduction in Food Imports

Two years ago, the Agricultural Economics Research Institute, Oxford, published a booklet, "The Planning of Britain's Food Imports," which showed the general changes in imports of agricultural produce since 1925. It analysed in particular the effect of the tariffs and quotas imposed in 1932 and subsequent years, not only on the total volume of imports but also on the proportions that came from Empire, as opposed to foreign, countries.

The Institute has now issued its second "Annual Supplement" to this publication, dealing with the imports of various agricultural commodities in 1935. The Institute's index number of the volume of food imports that competes directly with British farm products was 103 in 1935, compared with

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104 in 1934 and 117 in 1931, the year before restriction started. The imports are now only 3 per cent. higher than in 1927-9, when farm prices in this country were 18 per cent. higher than they are now. Only dairy product imports remain above the 1927-9 level.

The report concludes that while there has been a total reduction of 11 per cent., supplies from the Empire have increased by 17 per cent. since 1931 and foreign imports have dropped by nearly 30 per cent. As a result of these changes, not only have total food imports declined by 11 per cent., but the share of the market for imported food products which is filled by the Empire has risen from 38 per cent. in 1931 to 51 per cent. in 1935.

Sixth World's Poultry Congress, Leipzig, 1936

THE original intention to hold the Sixth World's Poultry Congress in Berlin had to be abandoned on account of the disastrous fire which destroyed the two halls in which it was intended to hold the exhibitions. Leipzig has, therefore, been chosen as the venue of the Congress, and is very suitable for the purpose owing to its central situation and the existence of excellent grounds and buildings. The papers will be read in the German Library and will comprise contributions on the subjects of instruction, organization, physiology and feeding of poultry; hatching, breeding and heredity; disease, economic questions; and rabbit breeding. The object of the papers will be to disseminate up-to-date information on these special subjects connected with the industry.

In addition, national exhibits will be staged to demonstrate the present methods of the Poultry Industry in the participating countries, also the most useful apparatus and equipment for breeding and production.

These congresses are organized triennially by the World's Poultry Science Association and have been held recently in Italy (1933), England (1930) and Canada (1927).

The German organizers of the Conference invite all persons associated with poultry and rabbit breeding to participate. The representation of the British Poultry Industry is being arranged by a National Committee whose Secretary, Major Ian Macdougall, O.B.E., 73, Southampton Row, London, W.C.1, will supply, on request, copies of the official programme, particulars of membership, transport, hotel

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accommodation, etc. In connexion with the Congress, which lasts from July 24 to August 2, a special tour has been arranged from August 3 to 10 and includes visits to Nuremberg, Munich, Stuttgart, Heidelberg and Frankfort; also a boat trip on the Rhine. Special arrangements have also been made for Congress members to visit Berlin.

Summer Visits to Rothamsted and Woburn

SIR JOHN RUSSELL, Director of the Rothamsted Experimental Station, again invites farmers and other persons interested in the practical, technical and educational aspects of agriculture, to inspect the experimental plots at Rothamsted and Woburn during the summer. As in previous years, Mr. H. V. Garner and Captain E. H. Gregory will be in charge of the demonstrations, which will continue until the end of October.

The farm at Woburn is on light soil, and there, in addition to the classical fields, modern experiments are in progress on potatoes, barley, sugar-beet, carrots, pyrethrum and green-manure crops.

At Rothamsted, where the soil is a heavy loam, the classical fields provide a valuable demonstration of the effects of fertilizers on wheat, barley, mangolds and meadow hay. Farmers who are confronted with manurial and cultivation problems consequent on mechanized cereal farming, will be specially interested in the continuous growing of wheat on Broadbalk field. Modern fertilizer and cultivation difficulties connected with the manuring of potatoes, sugar-beet, barley, kale, fodder crops and permanent pasture, are being investigated by up-to-date field technique. There are also experiments dealing with poultry manure, the effects of bare fallowing, rotary cultivation, and rotation experiments to test alternative methods of returning cereal straw to the soil. There is a complete electric installation, and the best types of implements are on view. The crosses of half-bred sheep are also being studied.

It is not possible to inspect both farms on one occasion, but either will afford ample interest for a full day's visit. Due notice of proposed visits should be sent to the Secretary, Rothamsted Experimental Station, Harpenden, who will be glad to have ample notice of visits from organizations of farmers, farm workers, etc., to avoid the possibility of dates clashing.

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Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, April 7, 1936, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board received notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following orders :—

Buckinghamshire.—An Order continuing the existing minimum and overtime rates of wages from April 26, 1936 (i.e., the day following that on which the existing rates are due to expire) until April 24, 1937. The minimum rates for male workers of 21 years of age and over are 32s. per week of 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31, with overtime at 9d. per hour on weekdays and 11d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day. The minimum rate for female workers of 18 years of age and over is 6½d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day.

Cumberland and Westmorland.—An Order fixing minimum and overtime rates of wages to come into operation on May 31, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until May 15, 1937. The minimum rates are for male workers of 21 years of age and over hired by the month or longer period 40s. (instead of 39s. as at present) per week of customary hours (which is defined as consisting of 62 hours), and for other whole time male workers of similar ages 32s. (instead of 31s. as at present) per week of 48 hours in winter and 33s. 6d. (instead of 32s. 6d. as at present) per week of 54 hours in summer, with payment for overtime unchanged at 8½d. per hour for all male workers. In the case of casual male workers of 18 years of age and over the minimum rate remains unchanged at 8d. per hour. For all female workers of 18 years of age and over the minimum rate remains unchanged at 5½d. per hour for all time worked.

Essex.—An Order fixing minimum and overtime rates of wages to come into force on April 12, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until March 27, 1937. The minimum rates for male workers of 21 years of age and over are 31s. 6d. (instead of 31s. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall when the hours are 41½, and 48 hours in winter except in the week in which Christmas Day and Boxing Day fall when the hours are 31, with overtime unchanged at 9½d. per hour on weekdays (including Easter Monday, Whit Monday and Boxing Day) and 10½d. per hour on Sundays and on Christmas Day. The minimum rate for female workers of 21 years of age and over is 6½d. per hour (instead of 6d. as at present) for all time worked.

Lancashire.—An Order fixing minimum and overtime rates of wages to come into operation on May 1, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until April 30, 1937. The minimum rates for male workers of 21 years of age and over are in the Southern Area for stockmen and teamsmen 37s. (instead of 36s. as at present) per week of 52½ hours; other

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workers 33s. 6d. (instead of 32s. 9d. as at present) per week of 50 hours, and in the remainder of the area of the Committee, for stockmen and teamsmen 40s. (instead of 39s. as at present) and other workers 37s. 6d. (instead of 36s. 6d. as at present) per week of 60 hours in each case. The overtime rates for all classes of male workers remain unchanged at 9d. per hour on weekdays and 1s. 1½d. per hour for employment (other than time necessarily spent in the immediate care of and attention to horses or stock) on Sundays. The minimum rate for female workers of 18 years of age and over remains unchanged at 6d. per hour.

Lincolnshire (Holland).—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on April 19, 1936, and to continue in operation until October 24, 1936. The minimum rates for male workers of 21 years of age and over are 35s. (instead of 34s. as at present) per week of 50 hours, except in the weeks in which Whit Monday and August Bank Holiday fall, when the hours are 41. In the case of horsemen, cattlemen and shepherds of similar age, additional weekly sums are fixed to cover all time worked in excess of the number of hours mentioned above, except employment which is to be treated as overtime employment. The overtime rates for male workers of 21 years of age and over are 10½d. per hour on Saturdays (or on any other day agreed as the weekly short day), 1s. 1½d. per hour on Sundays, 8d. per hour on Whit Monday and August Bank Holiday, and 9d. per hour for all other overtime employment. The minimum rate for female workers of 15 years of age and over is 6d. per hour with overtime at 7d. per hour for all employment in excess of 5½ hours on Saturday or other agreed weekly short day, on Sundays and in excess of eight hours on any other day, instead of 6d. per hour for all time worked as at present.

Northamptonshire and Soke of Peterborough.—An Order continuing the existing minimum and overtime rates of wages from April 26, 1936 (i.e., the day following that on which the existing rates are due to expire) until October 31, 1936. The minimum rates for male workers of 21 years of age and over are 31s. 6d. per week of 50 hours, except in the week in which Whit Monday falls, when the hours are 41, with overtime at 9d. per hour on weekdays and 11d. per hour on Sundays and Whit Monday. The minimum rate for female workers of 18 years of age and over is 6½d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays and Whit Monday.

Northumberland.—An Order fixing minimum and overtime rates of wages to come into operation at noon on May 13, 1936 (i.e., when the existing rates are due to expire) and to continue in force until noon on May 13, 1937. The minimum rates for male workers of 21 years of age and over employed as stewards, horsemen, cattlemen, stockmen or shepherds and hired by the week or longer period are 38s. 6d. (as at present) for workers who are householders, and 35s. 6d. (as at present) for workers who are not householders, per week of customary hours (not exceeding 62). For other male workers of 21 years of age and over (except workers in casual employment) the minimum rate is 31s. 6d. (as at present) per week of 48 hours in winter and 52½ hours in summer, overtime being payable in the case of all regular male workers at the rate of 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate for casual male workers of 18 years of age and over remains unchanged at 7d. per hour for all time worked. The minimum rates for female workers of 18 years of age and over remain

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unchanged at 5*d.* per hour in the case of regular workers and at 3*d.* per hour in the case of casual workers, with overtime at 6*d.* per hour and 4*d.* per hour respectively.

Anglesey and Caernarvon.—(1) An Order varying as from April 19, 1936, the existing minimum and overtime rates of wages for workers other than male workers employed in forestry. In the case of male workers of 21 years of age and over wholly or mainly employed as horsemen, cowmen, shepherds or hwsmyrn (bailiffs) the minimum rate is 35*s.* per week of 58 hours as at present. In the case of other male workers of similar age the minimum rate is 31*s.* per week of 50 hours as at present. Lesser rates are fixed for younger male workers of each class, provision being made for increases in the present rates. The minimum rates for female workers remain unchanged, the rate for workers of 18 years of age and over being 6*d.* per hour. The overtime rate for all classes of male workers of 21 years of age and over remains unchanged at 9*d.* per hour.

(2) An Order varying as from April 19, 1936, the minimum and overtime rates of wages for male workers employed in forestry. The minimum rate for male workers of 21 years of age and over is 36*s.* (instead of 35*s.* as at present) per week of 50 hours. The overtime rate for all male workers of 21 years of age and over remains unchanged at 9*d.* per hour.

(3) An Order fixing special minimum rates of wages for male workers of 18 years of age and over engaged specially for work in connection with the hay and corn harvests of 1936. The rate for male workers of 21 years of age and over is 7*s.* per day (as in 1935).

Merioneth and Montgomery.—An Order fixing minimum and overtime rates of wages to come into force on May 1, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until April 30, 1937. The minimum rate for male workers of 21 years of age and over employed wholly or mainly as stockmen, teamsters, carters or shepherds is 32*s.* 6*d.* per week of 58 hours (instead of 60 hours as at present) and the minimum rate for other male workers of 21 years of age and over is 28*s.* 6*d.* per week of 52 hours (instead of 54 hours as at present) with overtime in each case unchanged at 9*d.* per hour. For female workers of 18 years of age and over the minimum rate remains unchanged at 5*d.* per hour for all time worked.

Agricultural Wages (Regulation) Act, 1924, Appeal Case.—On March 26, 1936, a Divisional Court, consisting of the Lord Chief Justice, Mr. Justice du Parcq and Mr. Justice Goddard, heard the Ministry's appeal against the decision of the Pwllheli (Anglesey) magistrates regarding the assessment of the arrears of wages ordered to be paid to a worker in a case which was brought before them on July 31, 1935. The employer had been convicted on the charge of paying wages at less than the minimum rates, but, in their Order for arrears of wages, the Bench allowed him to reckon the provision of lodging as part payment of wages. The relevant Order of the Agricultural Wages Committee provides that an allowance in respect of lodging may be made "where the worker on his engagement agrees to avail himself of lodging provided by the employer." The worker in this case, however, had not so agreed, and had not availed himself of the benefit of lodging, and these facts were not in dispute. The Ministry's appeal was upheld by the Divisional Court, it being ruled that the

APPOINTMENTS

allowance made by the magistrates was inadmissible in the circumstances of the case. A transcript of the judgment follows :—

THE LORD CHIEF JUSTICE : This case is manifestly too clear for argument. It is quite obvious, whether one looks at the terms of the Statute, or at the terms of the Order, that the value of the benefit of lodging may not be taken into account unless that benefit is actually received under the terms of the man's employment. The mere fact that the lodging was open to him, if he had so wished, is perfectly immaterial. I refrain from adding more. It is quite clear that the appeal must be allowed ; the contention of the Appellant is clearly correct, and the case must go back to the Justices with a direction that the full amount must be ordered to be paid, that is to say, the full amount not diminished by the supposed value of the potential lodging.

Enforcement of Minimum Rates of Wages.—During the month ending April 13, 1936, legal proceedings were taken against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Essex ..	Southend	2 0 0	—	21 0 0	1
Hereford ..	Weobley ..	2 2 0	1 3 6	8 0 0	1
Lincs. Kest-even and Lindsey	Bourne ..	3 0 0	—	15 19 11	2
Suffolk ..	Halesworth	11 0 0	0 10 8	36 7 9	2
Worcester ..	Evesham ..	1 0 0	—	10 0 0	1
Carmarthen	Llanelly ..	5 0 0	—	24 6 3	1
		24 2 0	1 14 2	115 13 11	8

Foot and Mouth Disease.—No outbreaks of Foot-and-Mouth Disease have been confirmed since January 26. At the time this issue of the *Journal* went to press, no part of Great Britain was subject to Foot-and-Mouth Disease (Infected Area) restrictions.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Devonshire : Mr. W. G. Turpitt, B.A., has been appointed District Lecturer in Agriculture for South Devon, *vice* Mr. D. Rowe, N.D.A.

Mr. T. Neil, B.Sc. (Agric.), N.D.A., has been appointed District Lecturer in Agriculture for East Devon, *vice* Mr. G. D. Stevenson, N.D.A., N.D.D.

Durham : Miss M. D. Allan, N.D.P., has been appointed Assistant Poultry Instructor.

Isle of Ely : Mr. G. D. Stevenson, N.D.A., N.D.D., has been appointed Agricultural Instructor.

NOTICES OF BOOKS

Wiltshire: Miss J. M. Forster has been appointed Agricultural Instructor, *vice* Miss M. E. Cummins. N.D.D.

COUNTY AGRICULTURAL EDUCATION STAFFS: WALES

Anglesey: Mr. Arthur O. Williams, B.Sc., has been appointed Drainage Officer and Instructor in Agriculture.

Gaernarvonshire: Mr. H. R. Jenkins, N.D.P., Instructor in Poultry-keeping, has resigned.

NOTICES OF BOOKS

Farm and Machine. Vol. III. Pp. 256. (Oxford: Institute for Research in Agricultural Engineering. Price 3s. 6d., post free 4s.)

This volume contains the report of the Institute for Research in Agricultural Engineering for the year ended September, 1935, together with a full report of the proceedings of the recent Conference on Mechanization in Mixed Farming, held at Oxford, and noticed in the February, 1936, issue of this *Journal*.

"The Feathered World" Year Book, 1936. Ed. by O. Comyns Lewer and A. P. Thompson. Pp. 274. (London: "The Feathered World," 9 Arundel Street, W.C.2. Price 2s.)

This annual contains a large amount of useful information for all who are interested in poultry, whether suburban backyarders or owners of large-scale commercial plant. Although less than half the size of last year's issue, this new edition contains no fewer than 50 articles on poultry breeds, a breeding guide and glossary, marketing information, and a comprehensive list of breeders, club secretaries and judges. A helpful chapter is entitled "How to Recognize and Treat Common Poultry Ailments." There are sixteen pages of plates illustrating "Prize-Winning Birds," besides illustrations in the text; sections on waterfowl, pheasants, cage birds, budgerigars and canaries, a poultry "Who's Who," and lists of leading societies and the poultry press throughout the world.

Reports on the Work of Agricultural Research Institutes, etc., 1933-34. London: H.M. Stationery Office. Price 5s., post free, 5s. 5d.).

The work of Agricultural Research Institutes in Great Britain and Northern Ireland, together with the research work undertaken by agricultural advisory officers, and special investigations financed by the Departments of Agriculture and the Agricultural Research Council, are summarized in this volume. It presents a concise record, in non-technical language, of research work undertaken in agricultural science during the year, and should be of interest to those who wish to take advantage of the latest developments.

Scientific Horticulture. Vol. IV. Ed. R. T. Pearl, B.Sc., A.R.C.S., D.I.C. Pp. 218. (Published by the Horticultural Education Association. Obtainable from the Editor, South-Eastern Agricultural College, Wye, Kent. 1936. Price 3s. 6d.)

The Association, including as it does, members who are experts in the special branches of horticulture, finds no difficulty in publishing a year-book that contains informative articles of real value to all interested in horticulture. The volume for 1936, which seems even better than the volumes that have preceded it, includes articles outlining the development of market gardening, tomato growing and raspberry production in

ADDITIONS TO THE LIBRARY

Scotland; commercial horticulture in Sussex; small cultivators for horticultural purposes, and many scientific articles on special subjects varying from the effect of length of day on the flowering of plants to the virus diseases of glasshouse and garden plants. All these articles are excellent, as they give in a concise form modern thoughts on each subject. This volume should be appreciated by all who are anxious to keep abreast of developments.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous.

Howard, L. E.

Labour in Agriculture. An International Survey. (xiv + 339 pp.) Oxford University Press; London: Humphrey Milford, 1935, 18s.

(Issued under the auspices of the Royal Institute of International Affairs.)

The Horace Plunkett Foundation.

Co-operation and the New Agricultural Policy. (viii + 136 pp.) London: P. S. King & Son, 1935, 5s.

Rothamsted Conferences No. XXI.

The Use of Electricity in Agriculture, being the Report of a Conference held at Rothamsted on January 29th, 1936, under the Chairmanship of *Sir B. E. Greenwell*. (77 pp.) Contributions by *Sir E. J. Russell* and others. Harpenden: Rothamsted Experimental Station, 1936, 2s.

Report of the Royal Commission on Tithe Rentcharge in England and Wales. (Chairman: *Sir J. F. Williams*). (vi + 107 pp.) (Cmd. 5095.) London: H.M. Stationery Office, 1936, 2s. 6d.

Robinson, G. W.

Soils. Their Origin, Constitution and Classification. An Introduction to Pedology. (xvii + 442 pp. + 5 plates.) (2nd Edition revised and enlarged.) London: Murby & Co., 1936, 20s.

Birnie, A.

An Economic History of the British Isles. (ix + 391 pp.) London: Methuen & Co., 1935, 10s. 6d.

Buchanan, R. O.

Economic Geography of the British Empire. (x + 346 pp.) London: University of London Press, 1935, 6s.

Street, A. G.

Country Calendar. (xiii + 231 pp.) London: Eyre & Spottiswoode, 1935, 7s. 6d.

Pitt, Frances.

Wild Life Studies. (189 pp. + 9 plates.) London: Nelson & Sons, 1935, 3s. 6d.

Morrison, G. R.

Mixed Farming in East Africa. (xiii + 159 pp.) London: East Africa, 9 Great Titchfield Street, W.1, 1935, 12s. 6d.

International Institute of Agriculture.

Agricultural Education in the World. Vol. I, Europe. Part I (xiii + 335 pp.) Rome, 1935.
(Written in French and English.)

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Mason, J.

A History of Scottish Experiments in Rural Education from the 18th Century to the Present Day. (ix + 207 pp.) London : University of London Press, 1935, 5s.

(Publication No. 7 of the Scottish Council for Research in Education.)

Champlly, R.

Le fermier constructeur. (2nd Edition.) (223 pp.) Paris :

Lib. agric. et hort. de la maison rustique, 1935, 12 fr.

International Labour Office and International Institute of Agriculture.

Studies and Reports of the I.L.O. Series K (Agriculture) No. 13, on Movements of Agricultural Population. II.

The Rural Exodus in Czechoslovakia, *H. Böker and F. W. von Bülow.* (170 pp.) Geneva, 1935. London : P. S. King & Son, 5s.

Savoy, E.

L' Agriculture à travers les âges. Histoire des faits, des institutions, de la pensée et des doctrines économiques et sociales. Tome II. Première période de Hammourabi à la fin de l' Empire romain. (xvi + 478 pp.) Paris : E. de Boccard, 1935.

Longobardi, C.

Land Reclamation in Italy. Rural Revival in the Building of a Nation. Translated from the Italian by *Olivia R. Agresti.* (xii + 243 pp. + 29 plates.) London : P. S. King & Son, 1936, 12s. 6d.

XVI^e Congrès International d'Agriculture, Budapest, 13—20 Juin, 1934. 3 vols. Budapest : Ministère de l'Agriculture, 1934.

Statistics

Harrison, G. and Mitchell, F. C.

The Home Market. A Handbook of Statistics. (xv + 149 pp.) London : Allen & Unwin, 1936, 10s. 6d.

International Institute of Agriculture.

The First World Agricultural Census. Bulletin No. 3. Chile (15 pp.) Rome, 1935.

International Institute of Agriculture.

The First World Agricultural Census. Bulletin No. 4. New Zealand (45 pp.). Rome, 1935.

Board of Trade.

Report on The Import Duties Act Inquiry (1933). Part I, The Textile Trades, The Leather and Clothing Trades, The Food Trades, The Chemical and Allied Trades, Miscellaneous Trades. (xii + 329 pp.) London : H.M. Stationery Office, 1935, 5s.

Canada.

The Dominion Bureau of Statistics : Its Origin, Constitution and Organization. (63 pp. + 3 appendices.) Ottawa, 1935.

Land Settlement

Stapledon, R. G.

The Land Now and To-morrow. (xvii + 336 pp. + 11 pl.) London : Faber & Faber, 1935, 15s.

Menzies-Kitchin, A. W.

Land Settlement : Report prepared for the Carnegie United Kingdom Trustees. (xvi + 175 pp.) Edinburgh : T. & A. Constable, 1935.

Turnor, C.

Land Settlement in Germany. (30 pp.) London : P. S. King & Son, 1935, 1s. 6d.

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Muirhead, J. F.

Land and Unemployment. (xix + 211 pp.) London : Oxford University Press, Humphrey Milford, 1935, 7s. 6d.

Hoyland, J. S.

Digging for a New England. The Co-operative Farm for Unemployed Men. (224 pp.) London : Jonathan Cape, 1936, 5s.

Agricultural Economics.

The Agricultural Dilemma. A Report of an Enquiry Organised by *Viscount Astor* and *Mr. B. Seebom Rowntree*. (xiii + 101 pp.) London : P. S. King & Son, 1935, 2s. 6d.

Goldstein, J. M.

The Agricultural Crisis, Is it a Temporary Problem? (xi + 257 pp.) New York : The John Day Co., 1935, \$4.00.

Edgeworth, K. E.

The Price Level. A Further Problem in National Planning. (166 pp.) London : Allen & Unwin, 1935, 4s. 6d.

Cole, G. D. H.

Principles of Economic Planning. (xxiii + 435 pp.) London : Macmillan & Co., 1935, 6s.

Willcox, O. W.

Nations Can Live at Home. (279 pp.) London : Allen & Unwin, 1935, 10s.

Britain in Depression.

A Record of British Industries since 1929. Prepared by a Research Committee of the Economic Science and Statistics Section of the British Association. (viii + 473 pp.) London : Pitman, 1935, 10s. 6d.

Marketing.

Collins, V. D.

World Marketing. A Complete Guide to World Market Merchandising and Selling of the New Era. (327 pp. + 4 Diagrams.) Philadelphia and London : Lippincott, 1935, 10s. 6d.

Rowe, J. W. F.

Markets and Men. A Study of Artificial Control Schemes in Some Primary Industries. (ix + 250 pp. + 8 pp. plates.) Cambridge at the University Press, 1936, 7s. 6d.

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Marketing Agreements under the A.A.A. (xii + 446 pp.) Washington : Brookings Institution ; London : Faber & Faber, 1935, 11s. 6d.

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Percival, J.

Agricultural Botany, Theoretical and Practical. (xiv + 839 pp.) (Eighth Edition.) London : G. Duckworth & Co., 1936, 18s.

Chronica Botanica ; An Independent Annual devoted to all Branches of Plant Science. Vol. I (447 pp.) Leiden, Netherlands, 1935.

Swingle, D. B.

Plant Life. A Text Book of Botany. (xiv + 441 pp.) London : Chapman & Hall, 1935, 15s.

Thomas, M.

Plant Physiology. (xii + 494 pp.) London : J. & A. Churchill, 1935, 15s.

ADDITIONS TO THE LIBRARY

Imperial Bureau of Plant Genetics.

Vernalization and Phasic Development of Plants. (Bulletin No. 17 of the Imperial Bureau of Plant Genetics: Herbage Plants and Occasional Publication of the Imperial Bureau of Plant Genetics, for Crops other than Herbage.) (151 pp.) Aberystwyth and Cambridge, 1935, 10s.

Nutrition.

Orr, J. B.

Food, Health and Income. Report on a Survey of Adequacy of Diet in Relation to Income. (72 pp.) London: Macmillan & Co., 1936, 2s. 6d.

Harris, L. J.

Vitamins in Theory and Practice. (xix + 240 pp.) Cambridge at the University Press, 1935, 8s. 6d.

Plimmer, Violet G.

Food Values at a Glance and How to Plan a Healthy Diet. (94 pp. + 27 coloured plates.) London: Longmans, Green & Co., 1935, 3s. 6d.

The Farmers' Weekly.

Farmhouse Fare. A Cookery Book of Country Dishes. (160 pp.) London: The Farmers' Weekly, 1936, 1s.

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Brumley, O. V.

A Text Book of the Diseases of the Small Domestic Animals. (2nd edition.) (xxi + 611 pp.) London: Baillière, Tindall & Cox, 1931, 25s.

Thompson, H.

Elementary Lectures on Veterinary Science. 5th Edition Revised by A. C. Duncan. (viii + 465 pp. & 49 plates.) London: Baillière, Tindall & Cox, 1935, 10s. 6d.

Smith, F.

A Manual of Veterinary Physiology. (Fifth Edition.) (xv + 892 pp. + 1 plate.) London: Baillière, Tindall & Cox, 1921, 25s.

Crops.

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A.R.C. Report Series No. 1. A Report by a Committee on the Preservation of Grass and other Fodder Crops (Chairman: Sir W. C. Dampier.) (35 pp.) London: H.M. Stationery Office, 1935, 1s.

Gutierrez, V.

The World Sugar Problem, 1926-1935. (188 pp.) London: Norman Rodger, 1935, 6s.

Davis, J. S.

Wheat and the A.A.A. (xvii + 468 pp.) Washington: Brookings Institution; London: Faber & Faber, 1935, 13s. 6d.

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Salisbury, E. J.

The Living Garden or The How and Why of Garden Life. (xi + 338 pp. + 17 plates.) London: G. Bell & Sons, 1935, 10s. 6d.

Hellyer, A. G. L.

Practical Gardening for Amateurs. (287 pp. + 31 plates.) London: W. H. & L. Collingridge, 1935, 5s.

Shewell-Cooper, W. E.

The A. B. C. of Gardening. (320 pp. + 19 plates.) London: The English Universities Press, 1935, 5s.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 3 June, 1936

NOTES FOR THE MONTH

Barley : Decision of Import Duties Advisory Committee

In a letter, dated May 13, to the National Farmers' Union, the Import Duties Advisory Committee announced that they had decided not to make any recommendation at present with regard to the application of the National Farmers' Union, supported by the Scottish National Farmers' Union, for the imposition of an additional duty on imported malting barley. A similar decision has been made with regard to the application of the Scottish Chamber of Agriculture for an additional duty on all imported barley.

The Import Duties Advisory Committee expressed the opinion that in view of the high proportion (approximately two-thirds) of imported barley consumed by the agricultural industry, an additional duty on all imported barley would not be of advantage to the industry as a whole. At the most, it would be possible to impose only a moderate rate of duty, of little value to home growers generally, and, in particular, to those producing barley of malting quality.

The administrative difficulties of imposing an additional duty on malting barley only are such that the Committee considered it preferable to explore the possibilities of voluntary undertakings by the beer brewing and whisky distilling industries with regard to the use of home-grown barley. The Brewers' Society, whose membership accounts for about 95 per cent. of the beer output of this country, informed the Committee that it is the intention of its members collectively to make every effort to purchase, in each year ending in June, a minimum quantity of 7,500,000 cwt. of home-grown barley. It is also intended by the Society to increase purchases in proportion to any increase in the production of beer in the period ended September 30, 1935, as officially recorded in standard barrelage. The quantity of

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7,500,000 cwt., representing roughly seven-tenths of the total quantity of barley used in brewing, is equivalent to the quantity purchased by members of the Brewers' Society in the year ended June, 1935, and is regarded by the Committee as a satisfactory quantity under present conditions. The Society has agreed to make such annual statistical returns to the Committee as may be thought necessary for the purpose of judging the extent to which this undertaking has been carried out.

The Committee has made similar inquiries into the use of home-grown barley by distillers. The principal outlet for home-grown barley in Scotland, apart from its use on the farm, is the pot still section of the whisky industry. It was found that during the past year a number of pot still malt distillers had purchased home-grown barley at some financial sacrifice, in spite of the availability of imported barley of comparable quality. From reports received by the Committee it appears that the purchases of home-grown barley represented over four-fifths of the total barley purchases. One large company, responsible for the greater part of the consumption of barley by pot stills, has undertaken to continue its support of the Scottish barley growers. The Committee will collect annual statistics as to the consumption of home-grown barley by the pot still malt distillers. In the circumstances the application for an increased duty on malting barley will be regarded as in suspense so long as the Import Duties Advisory Committee is satisfied that brewers and distillers are implementing their undertakings to the best of their ability.

Maize

THE following note has been communicated by The International Institute of Agriculture, Rome:—

The first estimate of the Argentine maize crop, which is of very great importance to the world market, was published much earlier than usual. Since February 6 it has been known that the area sown to maize this year in the Argentine is 8.6 per cent. greater than that of last year, and 29.4 per cent. above the five-year average. Information indicated that weather conditions at the beginning of the growing period were excellent. Estimates were then circulated from private sources giving exaggerated figures for the maize crop. The official estimate, which was given at the beginning of the

harvesting of the early varieties, took into account sufficiently the area on which the crop had been destroyed by locusts in certain parts of the provinces of Buenos Aires, Santa Fé and Entre Rios, as well as the damage that had been caused by the excessive heat and drought during January and February in parts of the provinces of Buenos Aires, Cordoba and San Luis.

In Argentina, the area of the crop destroyed has often exceeded 30 per cent. of the area sown, as in 1932, 1933 and 1934. Although it is not possible to speak of a cyclical movement in this respect, it is interesting to notice that, on the average, during the five years 1925 to 1929, out of 100 acres sown, 18 were destroyed, while, during 1930 to 1934, 30 were destroyed. An explanation of this increase may be found in the fact that in the very great expansion in the acreage sown, which occurred during the period under consideration, maize was being cultivated on areas less suited to this crop.

Although smaller than the forecast made by the private sources, the harvest of this year, estimated by the Argentine Government at 213 million centals (380 million bushels) against 253 million centals (452 million bushels) in 1935, and an average of 171 million centals (305 million bushels) in the five preceding years, shows again a plentiful production surpassed only by that of 1931, and the record harvest of 1935. According to the first estimate, still subject to modifications, the yield per acre sown will be 11.3 centals per acre or 20.1 bushels per acre, that is, equal to the final figure of the yield obtained in 1930.

Information to hand reveals that there was an increase in the domestic consumption of maize in Argentina, and that the Government measures are tending to increase it still further. It is known, moreover, that there will be no strong competition from the Danubian countries, of which Rumania only has larger supplies available for export. Nevertheless, disposal on the world market of the large Argentine supplies made up of this year's crop and the stocks from last year, is a serious problem for the Argentine Government, particularly as efforts are being made by nearly all countries to reduce imports of this cereal.

The Government of the Union of South Africa has published a first estimate of this year's crop, which appears to be smaller than that of last year and even below the average for the preceding five years which includes the very bad year of

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1932-33. The weather was unfavourable to the maize crop, which has suffered particularly from drought.

The information on the producing countries of the northern hemisphere is still limited and fragmentary. It is important, however, to note that there will probably be an increase in the crop in the United States, which is the most important producer of this cereal in the world. According to the returns of farmers on March 1, the area indicated for harvest in 1936 showed an increase of 6.5 per cent. compared with the harvested area of 1935. On the other hand, the Government of the U.S.S.R. has approved for 1936 a plan fixing the acreage to be sown at a figure 12.2 per cent. smaller than that fixed by the plan of 1935.

Sampling Observations on Wheat 1935-36: Report for Second Quarter

A SUMMARY of the observations appears in the Table on p. 210, and shows the date of tillering (defined arbitrarily as the moment when the number of shoots is double the number of plants), the rate of tillering at tillering date in tillers per 100 plants per week, and the plant number at tillering date. The date and the rate are as a rule determined from four weekly counts.

Growth continues to make unusually slow progress this season. The intervals between appearance above ground and tillering were considerably longer than in 1932-3 or 1934-5, but about the same length as in 1933-4. Tillering date was reached first at Seale-Hayne, for the fourth successive year, this time on February 5; last year the date was December 10. The only other station to tiller in February was Cirencester, a prolonged cold spell during the remainder of that month checking the progress of the plant. Six stations tillered in March. The general rule in previous years has been that unless favourable weather conditions induce it early, tillering takes place in the last three weeks of March. Exceptions to this rule were provided this year by Newport, where the very sparse crop did not tiller until April 14, and by Boghall, where tillering was nearly a month later.

A statistical examination of the results of the first three years' observations gave the interesting result that while the interval between appearance above ground and tillering date

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varied from station to station and from year to year, it was not clearly related to the temperature, which is perhaps at first sight surprising.

The differences in tillering date of the two standard varieties, Squarehead's Master and Yeoman, were, in all instances, small. The local variety was again later in tillering than the standard varieties at the three stations at which it was grown.

The rate of tillering depends mainly on the temperature during the period of rapid shoot formation. The range in rates is high this year, low values occurring at Seale-Hayne and Long Sutton and very high ones at Wye and Plumpton. The highest rates correspond to the production of a shoot per plant in about 12 days. Rates were generally somewhat higher for Squarehead's Master than for Yeoman.

The plant densities at tillering date give a measure of the apparent plant elimination by comparison with the first plant counts given in the first quarter's report. The elimination may, of course, be partly masked by late germination. The decreases in plant number were exceptionally high at Cirencester (44 per cent.), Long Sutton (42 per cent.) and Sprowston (35 per cent.). The apparent loss was about the same this year for the two standard varieties; in previous years it has generally been slightly less for Squarehead's Master than for Yeoman.

It is pleasant to be able to record that the observations on tillering were reasonably complete at all stations except for the poor crop at Newport, and the dates and rates have all been precisely determined.

Note.—The plant numbers at the first count for Newport and Boghall were too late to be included in the first quarter's report (see p. 1203 of the March issue of this JOURNAL). The figures were :—

Station	Variety	Plant density per 32 metres drill	
		First Count	Date
NEWPORT Shropshire	S.H.M.	510	Feb. 28
	Yeoman	513	
BOGHALL Edinburgh	S.H.M.	1,658	Mar. 17
	Yeoman	1,472	

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SAMPLING OBSERVATIONS ON WHEAT, 1935-36. SECOND QUARTER.

Station	Variety	Tillering				
		Date	Standard error of difference	Rate Tillers per 100 plants per week	Standard error of difference	Density (Plant number per 32 metres)
CIRENCESTER Gloucestershire	S.H.M.*	Feb. 20'07	{ ± 1'31	28'1	{ ± 3'20	889
	Yeoman	Feb. 22'00		29'0		902
	Victor	Feb. 24'73		25'9		778
LONG SUTTON Hampshire	S.H.M.	Mar. 21'90	{ ± 2'68	16'4	{ ± 2'92	1,062
	Yeoman	Mar. 24'42		10'1		1,315
SPROWSTON Norfolk	S.H.M.	Mar. 4'30	{ ± 1'90	29'5	{ ± 4'23	1,127
	Yeoman	Mar. 3'50		22'7		1,020
WOBBURN Bedfordshire	S.H.M.	Mar. 13'75	{ ± 0'412	36'6	{ ± 2'71	1,514
	Yeoman	Mar. 12'52		35'7		1,355
SEALE-HAYNE Devonshire	S.H.M.	Feb. 5'12	{ ± 3'53 ¹	15'6	{ ± 1'92 ¹	1,812
	Yeoman	Feb. 4'98		12'8		1,859
	Garton's No. 60	Feb. 12'44		20'7		1,692
ROTHAMSTED Hertfordshire	S.H.M.	Mar. 14'28	{ ± 0'455 ¹	36'0	{ ± 2'44 ¹	1,451
	Yeoman	Mar. 12'31		37'5		1,400
	Victor	Mar. 26'38		29'5		1,249
NEWPORT Shropshire	S.H.M.	Apr. 13'86 ²	{ ± 0'943	69'3 ²	{ ± 9'92	397
	Yeoman	Apr. 15'05 ²		44'8 ²		382
PLUMPTON Sussex	S.H.M.	Mar. 18'60	{ ± 0'481	63'7	{ ± 3'16	722
	Yeoman	Mar. 19'30		60'2		599
BOGHALL Edinburgh	S.H.M.	May 11'38	{ ± 0'757	26'7	{ ± 1'48	1,122
	Yeoman	May 8'06		34'7		1,125
WYE Kent	S.H.M.	Mar. 26'56	{ ± 0'564	68'1	{ ± 9'78	1,568
	Yeoman	Mar. 26'16		73'7		1,526

* Squarehead's Master.

(1) Applicable to Squarehead's Master and Yeoman only.

(2) Based on two observations only.

Stations are arranged in order of sowing date.

Importation of Cherries

WITH the object of preventing the introduction of the Cherry Fruit Fly, the Minister of Agriculture and Fisheries has made an Order under the Destructive Insects and Pests

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Acts, 1877 to 1927, regulating the importation of cherries into England and Wales during the 1936 season.

Cherries grown in *Spain* and *France* have been admitted without restriction until May 27, after which date importation from these countries has been prohibited, except of French cherries grown within a small district around Honfleur; details of this district are given in the Order.

Cherries grown in *Germany* will be admitted until June 26 if accompanied by a Certificate of Origin; after that date no German cherries will be admitted except those certified not to have been grown south of latitude 53° N. or in East Prussia.

Cherries grown in any other European country will be admitted if accompanied by Certificates of Origin. The importation of *Italian* cherries is, however, prohibited under the *Treaty of Peace* Order.

Copies of the Importation of Raw Cherries Order of 1936 (S. R. and O. 1936, No. 384) may be obtained from H.M. Stationery Office, price 1*d.* net, post free 1½*d.*

Wheat in 1935: Production, Supplies and Requirements

THE following note has been communicated by The International Institute of Agriculture, Rome:—

The statistical position of the current year, according to the information received by the International Institute, is as follows:

The world wheat crop of 1935, excluding that of Russia, China, Turkey, Iran and Irak, was one of the smallest harvested since 1924. It was only 1 per cent. larger than the very small output of 1934 and 8 million metric tons short of the average production obtained in the five years 1929 to 1933. The 1935 wheat year has one feature in common with 1934 in that poor results were recorded in all the important exporting countries. The total production in 1935 is estimated to be 54.9 million metric tons, which is 16 per cent. below the quinquennial average. The reduction is the outcome of the damage resulting from rust in the United States and from drought in Australia, Argentina, the Danube countries and North Africa. Harvests in the importing countries, however, were plentiful, output being equal to that of 1934 and 9 per cent. above the average. The preliminary estimate of the

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crop of the U.S.S.R., which, however, may differ widely from the final returns, indicates a production of 31.3 million metric tons, or 900,000 metric tons larger than the crop of 1934. This estimate, considered with the increase in exports that has occurred this year, confirms that wheat production in Russia was plentiful. The crop of China is again said to be 15 to 20 per cent. smaller than the yield of 1934 owing to drought in the north and to floods in Central China.

The exportable wheat supplies of the year 1935-36 are estimated to be 20.5 million metric tons, the lowest figure of the post-war period; it is 16 per cent. smaller than that of the previous year, which was itself a low record and 45 per cent. below the high record of 1928-29. These supplies consist of 10 million metric tons carried over from previous harvests and about 10.5 millions of the 1935 crop.

The probable requirements of the importing countries are placed at 14.7 million metric tons. The statistics of commercial wheat movements of the first half of the current season show that the net wheat exports of all the exporting countries were 7.1 million metric tons and thus even smaller than the reduced shipments of the previous year. European wheat imports during the same period were 4.9 million metric tons against 5 millions in the preceding year, and thus constitute a low record.

The reduced world wheat demand, as revealed by the commercial movements of the first six months of the year, is the result, not only of the plentiful internal supplies of wheat and other food products in the importing countries, but also, to a large extent, of the political and financial situation which obstructs the movement of goods, labour and capital.

If the probable requirements of the importing countries (14.7 million metric tons) are compared with the exportable supplies of the surplus producing countries, it is seen that the exportable surplus of the 1935 crop (10.5 million metric tons) will meet only two-thirds of the probable world demand. To fill the gap, it will be necessary to draw 4.2 million metric tons from the old crop stocks, which on August 1, 1935, amounted to about 10 million metric tons.

Exportable stocks on August 1, 1936, will thus hardly reach 5.8 million metric tons, which is lower than the normal level of the pre-crisis period.

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Cider Developments in the West

ON May 7, 1936, about 2,000 people gathered at the Horticultural Research Station at Long Ashton to see the investigations on fruit culture and allied subjects and, in particular, results of research and technical developments as applied to cider making. Incidentally the occasion is widely known as "Cider Tasting Day," for prizes are awarded to those who sent apples that made the best cider.

It was noticed that samples of the same variety, grown in different localities, yielded cider of very different character, owing to soil influence. In the cider made from apples of the variety Kingston Black, slight variations in colour immediately attract the eye, but the main differences were in the malic acid content, which was as low as 0.52 and as high as 0.7 per cent. The tannin varied from 0.17 to 0.22 per cent. A normal cider of this variety would have an acidity of about 0.56 per cent. and a tannin content of 0.2 per cent., and throughout the West such a cider is regarded as incomparable. Kingston Black is a "vintage" variety, and the cider is so pleasing to the palate that usually it cannot be improved upon by blending. Unfortunately this wonderful apple of Somerset origin only succeeds in favoured localities; in fact, rarely is its culture so successful as in its native air in the Vale of Taunton Dene.

The majority of orchards contain a high proportion of "sharp" varieties, and the juice obtained from these has an acidity averaging over 0.6 per cent., so that the cider has a very brisk taste on the tongue and is not acceptable to many palates. The tannin content, on the other hand, is low, averaging 0.1 per cent. The cider from the sharp varieties is used for blending with that obtained from the sweeter kinds.

Sweet varieties have low malic acid and tannin contents, averaging 0.2 and 0.15 per cent. respectively; the cider from these is, therefore, rather insipid in taste. A blend of ciders made of sweet varieties (0.2 per cent. acid) with those in the "sharp" class (0.6 per cent. acid) yields a cider of which the acidity is of accepted standard, but still this cider is not ideal, for it lacks sufficient tannin and in consequence the flavour and body are usually deficient. The successful blend is secured by adding apples of the bitter-sweet type.

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Some years ago an important practical problem existed. At that time too few bitter-sweet apples were available, but they are being grown more widely in England now, for no less than 40 different lots of bitter-sweet apples were sent for making cider for Tasting Day. The cider from bitter-sweet apples lacked the briskness and was too rough on the tongue. Cider Tasting Day clearly demonstrated that good ciders could seldom be made by using the apples of single varieties.

The perfect cider, that is, one that is sufficiently acid and brisk, but not rough nor too sweet on the tongue, was found in Kingston Black cider, and by blending in the right proportions the juice from sharp, sweet and bitter-sweet kinds. For example, Cap of Liberty (sharp), Sweet Alford (sweet) and Knotted Kernal (bitter-sweet) gave a good blend. Pleasant bouquet or aroma is a more elusive quality and can only be secured by using apples of fragrant odour.

The research workers have applied science to cider making and have shown how to measure the effective ingredients in each class and how the proportions of each should be blended to obtain the perfect cider.

Unfortunately the cider orchards in the West, once well cared for, suffered from neglect for many years before the beginning of the present century, and to a lesser degree, until the end of the War. With each strong gale trees were blown down and no new plantings were made. Production steadily declined and it seemed that supplies of apples for the factories would, in time, entirely disappear or at any rate provide insufficient cider apples to make a good blend. In 1932 the National Association of Cider Makers recommended their members to enter into contracts with growers for cider fruit, providing for a minimum price of £4 per ton, to be paid by the cider manufacturers to the grower for deliveries of such cider fruit during the 5 years ending December 31, 1937. Confidence has been restored, and the growers began to prune, to spray their trees and to fill gaps in old orchards, and even to start new plantations, so that since 1932 it is estimated that more than 150,000 new trees have been planted.

On May 11 nearly 500 cider orchardists foregathered at Dartington Hall, Totnes, Devon, to celebrate Prizegiving Day in connexion with the Devon Orchard Improvement Competition.

This competition owes its inception to the foresight and

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generosity of the late Mr. Henry Whiteway of Whimble, who, in 1924, offered 100 guineas for the improvement of Devon orchards. A county Orchards Committee was established, composed of representatives of the County Agricultural Committee and the National Farmers' Union, which drew up a scheme.

The county was grouped into areas, and in each area silver cups were offered for the most improved orchards both over and under 5 acres in extent. Separate classes were established for newly planted orchards, for the best kept orchards, and for the orchards producing the heaviest crops. Each competitor's orchard is visited during the summer by a panel of judges, which assesses its initial condition and makes written suggestions as to the best methods of improvement. The orchards are visited again the following year and judged by the advance in points.

This competition has proved very popular. In all, there have been 122 competitors, many of whom have duplicated entries, and the judges are called upon to visit approximately 50 farms each year. It is estimated that 600 acres of established orchards, and 55 acres of newly planted orchards have been entered for competition, and the numerous trophies won outright have been generously replaced by Messrs. Whiteway. The competition has exercised a much wider influence than merely effecting an improvement in competitors' orchards—it has provided numerous demonstrational centres for planting, pruning and spraying classes, and has induced a better general conception of the economic advantages of farm orchard management.

Through the Orchards Committee, the Devon Federation of Cider Makers have been able to formulate a tree distribution scheme on the basis of one free cider apple tree per ton of cider fruit delivered to their factories. This scheme has operated for three seasons, during which 58,182 trees have been distributed, properly planted and protected. The Orchards Committee have endeavoured to forward the scheme by arranging for the annual prizegiving to take the form of a field day. The trophies gained in the 1935 competition were distributed by the Horticulture Commissioner to the Ministry of Agriculture, who gave an address on the trend of fruit production in relation to cider. Subsequently the various departments of the Dartington Hall Estate were open for inspection.

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Carnegie United Kingdom Trust

THE Twenty-second Annual Report of the Carnegie United Kingdom Trust, just published,* in addition to describing the work accomplished during the year under review (1935), gives a general account of the progress achieved during the quinquennial policy period 1931-35, and an indication of the lines on which the trustees propose to expend their revenues for the period 1936-40, the fifth quinquennium of the existence of the trust.

The trustees are impressed by the value of the work accomplished by *The Council for the Preservation of Rural England* in conjunction with the Ministry of Agriculture and other State Departments, and have decided to continue assistance for the preservation of rural amenities, on a descending scale till 1938. In future financial aid will not be granted to newly formed rural community councils, or to playing fields. In both these spheres it is considered that a standard of achievement has now been established, which should enable those who are responsible locally to develop the work in an adequate manner.

The quinquennial programme for 1936-40 includes allocations of £25,000 for village halls, on the scale of one-sixth of the cost of erection or adaptation, £2,500 in supplementary grants to existing rural community councils, £10,000 and £4,000 for rural development in Scotland and Ireland respectively, and £2,400 for Young Farmers' Clubs (during 1936 and 1937).

The most important allocation for 1936-40 is in the sphere of Land Settlement. Mr. A. W. Menzies Kitchin, of the School of Agriculture, Cambridge, has been conducting an inquiry into this subject, and has now presented a report on which the trustees have based their action during the quinquennium. The main points in this careful analytical survey are that, while there is no possibility of treating Land Settlement as a cure for unemployment on an indefinitely large scale, there is scope for experiment in co-operative smallholding schemes of 30-40 families, each holding 3-10 acres of land; and in co-operative part-time subsistence holdings. For schemes of these types, and others of the same general character that may be adopted, the trustees have confirmed the provisional

* *The Carnegie United Kingdom Trust: 22nd Annual Report, 1935.* Pp. vi+103. Obtainable from the Secretary, Carnegie United Kingdom Trust, Comely Park House, Dunfermline, Fife.

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allocation of £150,000 for 4-5 years, this sum to exclude the experimental grant of £10,000 to the pioneer Potton scheme, but to include a grant of £5,000 towards an estate at Andover in Hampshire promoted by the *Land Settlement Association*.

The report of the Potton settlement up to the end of last year is encouraging. The initial stage of this experiment is now complete, and while it is too early to say much about economic results, the value from the human point of view is already apparent in more than one direction.

In addition the trustees have resolved to make two further allocations to the Association, viz. £10,000 towards the capital cost of establishing 3 full-time schemes (40 families each) in distressed areas (outside the Commissioners' "special areas") in co-operation with county councils; and £10,000 towards the estimated cost of inaugurating 30 part-time settlements of 40 men each on the group-holding (quarter to half-acre) system.

The rural marketing experiments promoted by the *National Federation of Women's Institutes*, which will continue to receive grant aid at the rate of £500 per annum for 1936 and 1937, developed well during 1935. Seven new markets established during the summer, have brought the total number up to 34, registered under the Industrial and Provident Societies Act, and in each instance a marked improvement in the standard of produce has been noted.

Course on Applied Helminthology

A COURSE of lectures and demonstrations on Applied Helminthology for graduates and diplomates in agriculture, horticulture and veterinary sciences, members of the staffs of agricultural colleges, officers or intending officers of colonial agricultural and veterinary services, and officers engaged under local authorities, has been arranged by the University of London Extension and Tutorial Classes Council in co-operation with the Institute of Agricultural Parasitology, London School of Hygiene and Tropical Medicine, to take place from July 13 to 31 next. The course will have special reference to the control of agricultural and horticultural pests and the internal parasites of farm animals, poultry and game-birds. The lecturers will be Messrs. R. T. Leiper, F.R.S., T. Goodey, D.Sc., B. G. Peters, Ph.D., M. J. Triffitt, D.Sc., assisted in the demonstrations by Messrs. J. W. G. Leiper, M.R.C.V.S., and M. Franklin, B.Sc. The lectures will be

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delivered in Room No. 349 of the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, and demonstrations and practical work will be carried out in the laboratories of the Division of Medical Zoology, Room No. 327, London School of Hygiene and Tropical Medicine. Field demonstrations will be given at the Field Station of the Institute of Agricultural Parasitology, Winches Farm, Hatfield Road, St. Albans. For the purpose of qualifying for a Certificate of Attendance from the University, each student is requested to obtain daily the signature of the professor or lecturer in the space provided on his individual time table. Further information, including forms of application for admission to the course, may be obtained from the Secretary, London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1. Forms should be completed and returned, together with the tuition fee of four guineas, addressed "Helminthology," c/o The University Extension Registrar, University of London, London, S.W.7, not later than June 30 next.

Electro-Genetic Mutations

The French journal *Revue Horticole* published on April 16, 1936, contains an interesting article by Professor D. Alberto Pirovano on the artificial production of mutations in plants by treatment in an electro-magnetic field in contrast to the α and γ rays used by most geneticists. Very long wavelengths of low frequency in an intense magnetic field applied to the reproductive organs were found to cause mutations that were transmitted to succeeding generations. Good, viable mutations were most readily obtained by treatment of the anthers shortly before the maturation of the pollen: treatment of the ovules more often led to lethal results. Certain plants, especially those with large pollen grains, such as *Althæa* and *Cucurbita*, most easily gave rise to mutations. These included alteration in the colour of the fruit, reduction in the proportion of male flowers in dioecious plants such as Hemp (*Cannabis sativa*), dwarfing, segmentation of leaves or fasciation. With hybrids, treatment of the pollen grains generally gave rise to their enfeeblement and correspondingly increased development of the female organs, for instance in altered coloration and earlier ripening of grapes.

MILK MARKETING SCHEME :

REPORT OF THE COMMITTEE OF INVESTIGATION

THE Report* of the Committee of Investigation for England, on the complaints made by the Central Milk Distributive Committee and the Parliamentary Committee of the Co-operative Congress as to the prices and certain of the terms of the 1935-36 contract prescribed by the Milk Marketing Board for the sale of milk by wholesale, was published on May 6.

The complaints into which the Committee had to inquire were divided into about 26 separate heads and evidence was heard on 36 days from 62 witnesses. It is a matter for the deepest regret that after four meetings had been held, the Chairman, the Rt. Hon. Edward Shortt, K.C., died; and that, on the day following the presentation of the Report, his successor, Mr. James Whitehead, K.C., also died. The following tribute to the memory of these gentlemen was made by the Minister in the House of Commons on April 27 :

"The House will, I know, join with me in paying a tribute to the late Mr. Edward Shortt, K.C., and the late Mr. James Whitehead, K.C., for their high sense of public duty and the great services they rendered in turn as chairman of the committee. The untimely death of these two distinguished gentlemen is an event which we all, I am sure, very deeply deplore."

The following is a summary of the more important sections of the Report :

The Price of Milk for Liquid Consumption. The wholesale prices prescribed by the Milk Marketing Board for milk sold for liquid consumption averaged 15s. 6d. per 12 gal., an increase of 5d. per 12 gal. over those in the previous contract. The minimum retail prices were the same as in the previous contract, resulting in a reduction of 1½d. per gal. in the minimum distributive margins.

The Central Milk Distributive Committee complained that the minimum margins for 1935-36 were too small, and they desired that the minimum margins generally should remain

* Report of the Committee of Investigation for England on the Complaints made by the Central Milk Distributive Committee and the Parliamentary Committee of the Co-operative Congress as to the operation of the Milk Marketing Scheme, 1933. Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2, or through any Bookseller. Price 1s. 3d., post free 1s. 5d.

MILK MARKETING: REPORT OF COMMITTEE OF INVESTIGATION

at the same figure as in 1934-35, with the exception that the minimum margin in urban districts of under 10,000 population should be the same as for areas with a population of 10,000 to 25,000, and that the minimum margins in Manchester and Liverpool should be increased to correspond with those in towns of over 25,000 inhabitants in the South-Eastern Region. They also asked that the wholesale prices should be reduced to an average of 14s. 5d. per 12 gal. with a corresponding reduction in retail prices.

The complaint of the Parliamentary Committee of the Co-operative Congress differed from that of the other distributors in that it was admitted that the minimum margin prescribed in 1934-35 was higher than was necessary to cover costs of distribution by co-operative societies and provide a reasonable profit. Their complaint was that the prescription of the Board would mean the maintenance of retail prices at a level which they considered to be excessive and, therefore, detrimental to their trade as distributors. They were prepared to work on distributive margins reduced by 5d. per 12 gal. in London and 9d. per 12 gal. in the Provinces below those in the 1934-35 contract, provided that the wholesale price was reduced to 14s. 10d. per 12 gal.

The recommendations of the Committee of Investigation regarding the liquid prices are that the average wholesale price for the contract period 1935-36 should be reduced to 15s. 3d. per 12 gal., but that minimum retail prices should not be increased, thus increasing the distributive margin by 3d. per 12 gal.

The Committee emphasize that their recommendations are not to be regarded as a permanent basis for the contract. They do not desire to see either the distributive margin or the wholesale price stabilized at these figures, and they express the view that the industry would benefit by a reduction in the retail price of liquid milk. They do not see much prospect, however, of any considerable reduction unless there is an increase in the value of manufacturing milk and at the same time a reduction in distributive costs through the reorganization of the distributive side of the industry.

In arriving at their conclusions on this part of the complaints, the Committee make some interesting remarks on the subject of both producers' returns and distributive margins. While they have come to the conclusion that the price they recommend would be sufficient to cover the costs

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of production and transport and provide a fair profit to the reasonably efficient producer, they consider that the wide range of individual costs of production indicates that there is scope for improvement in managerial efficiency on some farms. They also consider that it may be possible to bring about some small reduction in the average transport charge. The Committee regard the figures relating to the investigation conducted by the Agricultural Advisory Economists as a valuable guide to the cost of milk production, and they hope that arrangements will be made by the Milk Marketing Board to continue this investigation over a period of years.

As regards distributors' margins, the Committee say that they have been deeply impressed by the unnecessary elaboration and waste of effort in the present distributive organization. They are convinced that some rationalization of distribution would make possible substantial reductions in distributive costs. Their recommendations as to margins are to be regarded as no more than provisional, and they hope to see a progressive and perhaps substantial reduction in future years. They think that, in the absence of organization by distributors, the Board may possibly have to assume responsibility for bringing about such reductions through the medium of the prescribed contract, in which case any reduction in the margin should be passed on to consumers.

The Transit Risk Charge. The transit risk charge, which is payable by producers to purchasers on all milk for liquid consumption passing through an approved collecting depôt, is prescribed at $\frac{1}{4}d.$ per gal. in the contract for 1935-36, compared with $\frac{1}{2}d.$ per gal. in the previous year. Both complainants objected to the reduction.

Divergent views were held by the Board and the complainants as to the basis on which the charge should be assessed, and on the benefits to producers and purchasers of the services which it covered. The Board contended that it covered transport risks such as sourage, spillage and damage to churns, and denied that, apart from these risks, which it valued at $1/30d.$ per gal., the services rendered at depôts were of any value to producers. The distributors had always regarded it as a "handling" charge and submitted that the criterion for assessment should be the value to the producer of the services provided by the depôts irrespective of the actual costs.

The Committee reject both these contentions and point out the position of depôts under the changed circumstances since the scheme came into operation. They regard depôts as a valuable and even essential part of the organization of the milk industry, the benefits of which accrue both to producers and to distributors, and they consider that the cost of operating them should be shared equitably between both parties. They estimate on the evidence that the average cost of handling milk at depôts is between 0.5*d.* and 0.6*d.* per gal. and, since they think that the producer derives slightly less advantage from them than does the distributor, they regard the prescribed charge of $\frac{1}{4}$ *d.* per gal., or slightly less than half the average cost, as fair to both parties.

The Price of Milk for Manufacture. The complaints under this head were concerned with the price of milk for manufacture into cheese, butter, condensed milk, milk powder, fresh cream, tinned and bottled cream, and condensed milk and milk powder for export, and the Committee examine in detail the complaints relating to each commodity. They agree generally with the view put forward by the Board that British manufacturers should concentrate on making high-class products, and that the Board should be entitled to name a price below which they are not prepared to sell milk. They do not regard these arguments as valid reasons, however, for not disturbing the prescription of the Board in relation to manufacturing prices. They point out that under present circumstances it would be impossible for the Board or producers to dispose satisfactorily of more than a very small fraction of the large quantity of milk which is surplus to liquid requirements, except to manufacturers. As the Board are selling at less than the cost of production, they are entitled to the highest price that can reasonably be paid by manufacturers, but, in everybody's interest, that price must be fixed on a basis that will enable manufacturers to sell their products in competition with imported supplies.

Cheese. The price prescribed for milk for manufacture into cheese (other than soft curd cheese and cream cheese) is governed by a formula which takes into consideration the prices of New Zealand and Canadian cheese in the winter months (September to February) and of New Zealand cheese only in the summer months (March to August). The complaint of the Central Milk Distributive Committee was that

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the prices so obtained were too high and did not allow cheese made by English manufacturers to compete on equal terms with Dominion cheese. They asked that Canadian cheese should be excluded from the formula in the winter period, on account of the small and diminishing quantities imported and also because during this period English cheese is made from fodder-produced milk; and they desired that in the summer period the price of milk should be nine-tenths of the price calculated on the prescribed formula, so as to make allowance for the reduced butter-fat content of the milk in that period.

The Committee state that the formula in the 1935-36 contract, although slightly more favourable to manufacturers than that in the previous contract, does not go far enough to meet reasonable requirements, and they recommend a modification of the formula applicable to the winter months, whereby the average of the prices of New Zealand and Canadian cheese is weighted on the basis of the respective monthly imports in the months in which the prices are taken. They do not recommend any change in the prescribed formula for the summer months.

The Committee remark on the very large differences in the costs of manufacture of cheese shown by different manufacturers, and they feel that the costs are in many cases susceptible of reduction. They observe that the average costs of the manufacturers whose accounts were put in evidence and the costs at the Board's factory were below the allowance for manufacture in the formula, and they think that this allowance might well be examined with a view to its reduction in the near future.

Butter. The Central Milk Distributive Committee complained that the fixed price of $3\frac{3}{4}d.$ per gal.— $4\frac{1}{4}d.$ in Cornwall—prescribed for milk for manufacture into butter, was unreasonable in view of the wide fluctuations in butter prices. They desired a price based on a formula that took into account the prices of New Zealand and Australian butter, subject to a premium on butter manufactured in Cornwall varying according to the butter-fat content of the milk.

The Committee of Investigation are of opinion that the price of milk for manufacture into butter should be related to the prices of imported butter, and they recommend a formula that takes into account the prices of New Zealand, Australian and Danish butter and also the relative quantities of butter on

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the market from each of these countries. They emphasize that their recommendation is put forward as a basis of settlement for the present contract period only and not as a permanent basis, and that considerable revision may be necessary when more experience of the working of the formula has been gained.

Other Products. The Comitée recommend that no action should be taken in connexion with the remainder of the complaints concerning the price of milk for manufacture into other milk products.

Approval of Dépôts. The transit risk charge and the manufacturing rebates are only allowed in respect of dépôts and factories approved by the Board. The approval of the Board is given for the period of the contract, and it is the practice of the Board to give three months' notice of their intention to withdraw or withhold approval. The complainants desired that the Board should give some greater security of tenure to dépôt and factory owners whose premises are approved.

The Committee consider it reasonable and desirable that a manufacturer or dépôt owner who has had his premises approved by the Board, and has incurred the expense of installing plant and machinery, should be given the longest possible security of tenure, and they make recommendations to give effect to this opinion.

Miscellaneous Clauses of the Contract. The remainder of the complaints was concerned with matters arising from the provisions of specific clauses of the Contract and Rebate Regulations, in certain of which the Committee recommend alterations.

THE APPLICATION OF POWER TO FARMING

ROGER NORTH.

WE cannot farm without machines. By machines I mean devices for doing something that would be done less easily or less efficiently without them. From this point of view, a spade is a machine, and its inventor was probably told he would do better to continue clawing up the earth with his hands in the way Nature had intended. The step from the spade to the plough substituted the muscles of an animal for those of a human being, and here we have an instance of power applied to an agricultural machine. When the power of an engine is used in place of the power of an animal, we have the third stage in the mechanization of farming, and it is with this stage that this article will deal.

Animals and engines both have their advantages and their disadvantages. A horse is cheap to buy, it eats food grown on the farm, it reproduces itself and to a certain extent repairs itself, and its manure is valuable. Nevertheless, it works slowly and for a limited number of hours, while the human labour involved is large in proportion to the work done. A tractor will do a lot of work with one man to drive it, it works quickly, and the limit of hours it will work per day is twenty-four. On the other hand, it is expensive both to buy and to run, since its fuel, oil, and spare parts cannot be grown on the farm but must come from outside. It hardly needs more skill to look after a tractor than a horse; only skill of a different kind, and this is largely a matter of training. The introduction of caterpillar tractors, and now pneumatic tyres, has disposed of the common objection that tractors were bad for the land and could not be used under conditions where horses would do no harm.

Whether horses or tractors are chosen as the source of power, must depend on many factors, such as the crops grown, the cost of labour, and individual temperament. Personally, I am a lover of engines and machinery, so it was probably temperament that decided me. Wheat, being the easiest crop to cultivate with machinery, attracted my attention from the beginning, and my farm is simply a wheat-producing factory, with paraffin as the motive power.

The difference between "Prairie Farming" and wheat-

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growing in England is that, in this country, it is necessary to preserve the soil fertility, and it is hoped to show that the methods described are at least aimed at doing this. Two important points are made here: the need to keep the land clean, and to put back into it the manurial equivalent of what the crop removes. A third, and perhaps the most important requirement, is to keep the soil supplied with humus, or as some prefer to say, to keep it in good heart.

On my farm, manure is applied in the form of chemical fertilizer. In the autumn, immediately after sowing, fields that are in wheat for the second year in succession, receive 2 cwt. per acre of I.C.I. Concentrated Fertilizer No. 4. This contains 10 per cent. of nitrogen, 20 per cent. of water-soluble phosphoric acid, and 10 per cent. of potash. It is equivalent to a mixture of sulphate of ammonia, superphosphate, and potash salts. In the early spring, all the wheat receives between 1 and 2 cwt. per acre of nitro-chalk, the exact amount for each field depending on the state of the crop. With a fertilizer drill nearly 10 ft. wide, drawn by a tractor at between 4 and 6 miles per hour, it is possible to cover up to 6 acres in an hour, so that distribution does not take long.

To clean the land, a bare fallow is taken every three years, so that the rotation is Wheat-Wheat-Fallow. By cultivations, described later, the land is cleaned and freed of weeds, at least as far as this is ever possible. Mustard is then sown, and when it is at a suitable stage of growth it is ploughed in. This ploughing in of a green manure helps to keep the land in good heart and improves the tilth by supplying humus to the soil, as the vegetable matter of the mustard rots down and is acted on by the soil bacteria. With the soil clean and supplied with humus, the land is ready for another two wheat crops without suffering any harm.

My farm has an arable acreage of 507. There are twenty fields, which average 25 acres each; the largest is 36 and the smallest 14½ acres, so their size is well suited to the use of large implements. I have not removed any hedges, but gateways have been enlarged to allow wide implements to get from one field to another. As I have no sheep or cattle, the absence of gates does not matter. The soil is a clay loam and varies from light to heavy, most fields being on the heavy side. In my predecessor's time two horses would plough an acre a day.

Implements, Speed of Working, etc. As regards the

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speed of implements, in order to find the number of acres per hour that a certain implement will do, the most obvious way is to set the implement to work and to measure the area it has covered in an hour's running. To base calculations on this, however, is as if one were to say: "A car will go sixty miles per hour, therefore in an hour's running it will cover sixty miles." The car does not travel at the same speed all the time, and a farm implement also goes faster or slower according to the weather, the state of the soil, and other factors. Seed and fertilizer drills have to be filled at intervals, ploughs must have their shares changed, tractors must be fuelled; and, in fact, in all operations a certain amount of time is spent in doing jobs of this kind; and such factors must be included when estimating how long a certain job will take. To give an example, a four-furrow plough cutting 12 in. furrows, drawn by a tractor at from two to three miles per hour, should theoretically do about an acre an hour. A two-furrow plough should do half this. Now I find that taking both my ploughs, a two- and a four-furrow together, and dividing the total acreage they have ploughed in a season by the number of hours the men have been ploughing, the figure which I get is rather under half an acre per hour. This is 33 per cent. of the theoretical average figure. Of course, in wet weather and on heavy land, the plough goes more slowly; and, in any event, much time is spent changing shares, turning headlands, and adjusting and fuelling the tractor. To estimate how long it will take to plough, say fifty acres, it is not the speed of working under favourable conditions that must be taken, but this speed less from 40 to 50 per cent. Exactly the same principle applies to other implements. The speeds of working given below are the full theoretical speeds based on the width of the machine and the rate at which it moves, but the remarks I have just made should not be forgotten, if these speeds are to be of any value for comparison with other methods.

I have two wheeled tractors with four-cylinder paraffin-burning engines. One is 25/40 horsepower and the other 12/20 (the double figures refer to Drawbar H.P. and Belt H.P. respectively). Wheeled tractors are quite satisfactory on my land, so that the extra expense that Caterpillars entail is saved. Each tractor has its own driver, who looks after it. These men had originally looked after horses, and at the outset knew nothing about tractors or machinery. However, they were willing to learn, and now, not only drive their

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tractors, but are able to decarbonize them, adjust the bearings and do other necessary running repairs and adjustments. When more difficult repairs are necessary, such as putting in new cylinder liners, or renewing the gearbox bearings, I have an engineer from the works, who is helped by my men, and they learn quite a lot from him.

Each tractor does an average of about 1,700 hours running every year. This works out at $5\frac{1}{2}$ hours per working day, though for many days they are not in use at all, while, on other occasions, 18 hours a day may be usual. A set of cylinder liners and pistons lasts about three years, or 5,100 working hours. Roller bearings in the gear box, main bearings, and various other parts wear out in that time and must be replaced. The larger tractor has also, after $3\frac{1}{2}$ years, had to have its crankshaft reground, and the smaller one may soon need similar treatment. Experience suggests that a life of about 5,000 working hours may be expected from those parts of a tractor that are subject to the greatest wear. If these replacements are periodically made and the machine is otherwise well cared for, there would seem to be no definite limit to the life of a good tractor. One must not, however, quite forget the story of the man whose thirty-year-old knife had had six new blades and four new handles; and a time must doubtless come when it ceases to be economic to continue buying replacements. This time has certainly not yet arrived in the case of either of my tractors, and at $3\frac{1}{2}$ years old they still have a lot of useful service before them.

With regard to the consumption of paraffin, I am not able to give figures for each tractor separately. The machines are fuelled from fifty-gallon drums mounted on sledges, two drums to a sledge. One of these outfits goes with each tractor if they are far apart, but if they are in the same field, a single-outfit suffices for both. The paraffin is transferred from the drum to the tank by means of a pump, so that the minimum time is wasted. This, I think, is the most efficient fuelling system so far devised, but it does not permit of a record being kept of individual consumption. The figures given below are obtained by dividing the total amount of paraffin bought by the total number of hours worked: they therefore refer to the two machines taken together. For the larger tractor alone they would be somewhat higher and for the smaller somewhat lower. They may be thought of as applying to a tractor of 18/30 H.P. half-way in size between the two.

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For the first season (October 1932 to September 1933) the figure was 1.58 gal. per hour, for the second season 1.35 gal. and for the third 1.46 gal. These figures are of course averages for all the operations the tractors do. The differences in the figures for the three seasons may partly be explained by the fact that I have not been able to take into account the paraffin bought but not used, and left in storage at the end of the season. This might amount to as much as 3 per cent. of the total. It is perhaps justifiable to say that the average consumption is just under 1½ gal. per hour; also, that the third year is not higher than this average; and so, as far as fuel consumption is concerned, the tractors have not lost any of their efficiency.

Figures for the consumption per acre when ploughing, have also been determined, they are as follows: first season 3.39 gal., second season 3.72 gal., third season 3.57 gal. The average for the three seasons is 3½ gal. per acre ploughed. Two-thirds of the ploughing is done with a furrow press drawn behind the plough, and one third with alternate mouldboards off for fallow cultivation.

Preparing the Land. To prepare land for wheat it is ploughed round and round, ending up in the middle of the field. The ploughs are fitted with a self-lift and are raised at the corners, leaving diagonal headlands that are finished off afterwards. The reason for this is that it saves time in setting out the work, and the Combine Harvester, following the same path later on, has a smoother journey. After ploughing, the land is harrowed. I have a large whippetree 30 ft. wide on two wheels, a set of chain harrows, and two sets of balk harrows, heavy and light, and any of the harrows can be attached to the whippetree. At about three miles per hour, 11 acres per hour can be covered with this outfit. The seed is drilled with a 10 ft. drill having 20 disc coulters. This machine measures out the seed by means of a fluted cylinder revolving half in the seed box. The speed of working is anything up to 7 acres per hour, but it depends more than most implements on the state of the soil. An attempt to go too fast when the land is sticky results in clogging of the coulters so that the seed is blocked. The distribution of fertilizer has already been mentioned: the machine used has been one having reciprocating, slatted plates at the bottom of the fertilizer box. This has not been found altogether satisfactory for

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concentrated fertilizers that have to be sown in small quantities per acre, and a quite different type of machine is about to be tried.

In the spring, the wheat is harrowed and rolled to clean it and to break up and aerate the surface. Rolling consolidates the soil so as to get a firm plant. The roller is a Cambridge pattern in three sections each 9 ft. wide. Under good conditions it is possible to cover 7 acres per hour, but the roller takes quite a lot of power to pull it.

Fallowing. Before coming to harvest, a description of the fallow cultivations may be useful. In the autumn the fields that are to carry wheat are ploughed first, then those that are to be fallowed are begun. For these, alternate mouldboards are removed, and this leaves the land in upstanding ridges so that the winter frosts can get well into the soil. In the spring the cultivator is brought into action. This has 15 spring-loaded tines covering a width of 11 ft., so that, at $2\frac{1}{2}$ miles per hour, it covers $3\frac{1}{2}$ acres per hour. The speed, however, depends greatly on the soil conditions and on the size of points fitted. Work is started with small points which go through the ground easily and break it up. Larger points are then substituted and these go below the soil cutting all weed roots. The machine has a power-driven self-lift and the tension of the springs which force the tines into the ground, is adjustable while running. Nearly 2,000 hours' work have been done with this cultivator in the $3\frac{1}{2}$ years I have had it.

The next step is to harrow the land, and this is done until twitch and other weeds and their roots begin to lie about on the top of the soil. The chain harrows are then turned upside down, the points facing upwards, and are drawn quickly up and down the field. This collects the weeds into bundles so that they can be pitchforked into heaps and burnt. Mustard is then sown and when it has come up, if the weather does not permit ploughing it in, as has happened the last two years owing to very dry summers, I invite my neighbours to put their sheep on it. In either case the soil cannot fail to benefit.

Harvesting. Harvest is done in two stages. First the corn is cut and threshed in one operation by a Combine-Harvester. The reaper part of this has a 12 ft. knife, and at 3 miles per hour it will deal with nearly $4\frac{1}{2}$ acres per hour. Actually, in 1934, it averaged $1\frac{1}{3}$ acres per hour for the whole harvest,

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doing 347 acres in 23 working days. In 1935, it averaged $1\frac{1}{2}$ acres per hour, doing 364 acres in 22 working days. These two years were exceptionally fine and dry, but even so, there was enough rain to help bring the acres per hour down from $4\frac{1}{2}$ to $1\frac{1}{2}$ and $1\frac{1}{2}$ respectively. Light rain does not stop a Combine, but it slows it down a lot. If the men try to go too fast in wet corn the straw is apt to tangle round the drum and make a jam. When this happens, it may mean a delay of over an hour before it can be cleared, so it is very much a case of more haste less speed when working in wet weather. In the 1933 harvest, the weather was not so good and it took 25 days to cut 265 acres, the average per hour being about an acre. In that year, when the Combine was new, we had more troubles of one sort or another, than in the two succeeding years. Even so, we never had a breakdown to hold us up for more than half-a-day; and, last season, there was no involuntary stoppage lasting more than an hour. The Combine carries its own engine of about 30 H.P., which runs on petrol. About 200 gal. of petrol are used during harvest, though some of this is accounted for by the lorry carting corn. Threshing efficiency is high, as can be seen by examining the chaff and straw thrown out at the back: it is usually difficult to find a single grain that has missed the grain tank. This efficiency is partly due to good design, and partly to the fact that if the crop does not vary the threshing drum gets fed at an absolutely even rate.

The grain is delivered into a tank mounted high up at the side of the Combine. This holds 60 bushels and as soon as it is nearly full a motor lorry comes alongside, a chute is opened, and the grain runs into the lorry to be taken to the barn for the second operation of drying, cleaning and sacking. So far, three men are employed, one driving the big tractor that pulls the Combine, one on the Combine to see that it runs properly and to adjust the height of cutting when necessary, and my foreman, driving the motor lorry.

In the barn, is the drying and cleaning plant. There are three storage bins, each capable of holding about 90 sacks, and by using these, wet wheat can be kept separate from dry, should both come in on the same day. The dryer is fed from one of the bins. If the wheat does not need to be dried, the dryer can be by-passed and the grain goes straight into the dressing machine. The dryer itself is a flat steel tower, with two perforated metal sides measuring $5\frac{1}{2}$ ft. wide by 15 ft.

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high: the wheat passes slowly down, taking about an hour in its passage from the top to the bottom. Pure hot air is blown in (in the first year, furnace gases were used, but the millers did not like this) and up to 10 per cent. of moisture can be removed at one operation. It is rarely necessary to remove more than this; the millers specify a maximum of 15 per cent., and, on a rainy day, the wheat may come in with as high a moisture content as 25 per cent. I have dried a neighbour's wheat, which had been in a wet stack; and this must have contained over 30 per cent. of water. It had to go through the drier twice.

After being dried, the grain is put through a cleaning and dressing machine and is then sacked ready for disposal. The wheat is bulk-handled throughout; the Combine delivers into the lorry, the lorry tips its load into a receiving hopper in the barn, worms and elevators handle it as it goes through the drying and cleaning plant, and it is not put into sacks till the end of the whole process. Much labour is saved in this way. Two men only are needed to run the barn, one to look after the air-heating furnace and the engine, and one to sack off and arrange the full sacks for cartage. Usually I have also an old man or a boy who clears away the rubbish and tail corn from the dressing machine. The rate at which grain can be dealt with is between 12 and 20 sacks an hour. With an average crop of about 8 sacks, this is between $1\frac{1}{2}$ and $2\frac{1}{2}$ acres per hour, so that the Combine and the barn just keep pace with each other. The barn, however, is apt to be not quite so reliable as the Combine: belts come off, elevators jam and other minor breakdowns occur, so that often the barn gets seriously behindhand in its race with the Combine, and, when this happens, it has to work a night shift by electric light. Last harvest, I think there were about four occasions when the barn work continued all night.

The big fans that blow the hot and cold air through the dryer take a lot of horsepower: also, the dressing machine and the various worms and elevators require driving. The first year, I used an old tractor, bought second-hand for this purpose. This proved unreliable, and I now have a motor-car engine. This is actually a 1912 Rolls-Royce, bought from a car-breaker, and converted to run on paraffin. It has a governor and will deliver up to 40 B.H.P. so that the 12 H.P. or so necessary for the dryer and 6 or 7 more for the dynamo, are well within its capacity. During the rest of the year it

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furnishes power for making electric light and sawing firewood.

Before the Combine can get into a field, a path has to be cut for it with a binder; and for this I use an old 5½ ft. McCormick, bought second-hand. Two men are needed for it, a tractor driver and a man on the binder. When they have opened out the fields for the Combine, they go round with a trailer picking up the sheaves and making them into small stacks, which are threshed out by the Combine at the end of harvest. The total harvest labour is as follows: the Combine and its tractor, two men; the binder and its tractor, two men; the lorry, one man; the barn, two men. This is seven full-time men, plus an old man or boy in the barn. To be able to harvest over 360 acres in just over 3 weeks with this labour force is, I think, a triumph for mechanized methods.

One point I have not yet dealt with—straw. This is ejected at the back of the Combine as it goes along. If it were economic to pick the straw up, and bale it, I would do so, but it would need a third tractor, a pick-up and baling machine, and two more men. The pick-up baler is an expensive device; and, with straw at its present price level, I do not think the extra capital outlay would be justified. As I have no use for the straw, I burn it on the field where it lies, otherwise it would choke the plough later on. This may seem a pity, but at any rate the mineral constituents of the ash return to the soil, and as the long stubble is ploughed in, the only thing actually taken off the land is the grain.

In 1935, for the first time I adopted a method of counting the loads of grain coming from each field, so that I could form an estimate of the yield per acre. Most fields gave between 8 and 9 sacks to the acre; the average for the whole farm was 8½. The best field was a little over 11 and the worst, just below 5. This latter field had been badly attacked by rabbits. The figures for fields carrying their second crop of wheat in succession, were no different from those carrying wheat after a fallow. In 1934, the average yield was just below 8 sacks per acre, and, in 1933, it was just above 8. It seems safe to say that the exhaustion of the land, which was prophesied by some when I first started, has not begun to show itself yet.

Economics. Now, finally, as to the economics. It is not proposed to give the cost of operations in £ s. d. because I always find that other people's costs mean so little. Everyone

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has his own way of costing and so much depends on things like rent, depreciation, interest on capital, and other overhead charges. There are, however, running expenses, such as labour, seed, fuel and so forth, and it may be of interest to give the proportions of these. The total running expenses averaged over three years, amount to just over £3 per acre on the whole arable acreage. They are made up as follows: Wages $27\frac{1}{2}$ per cent., fuel (i.e. paraffin, petrol, and oil) $17\frac{1}{2}$ per cent., spares and repairs (including ploughshares) 11 per cent., seed 13 per cent., fertilizer 15 per cent., miscellaneous expenses 16 per cent.

In general, the use of tractor power has made it possible for me to farm with a very small labour staff; four men in all, and I could work with only three if it became necessary. The number of acres per man employed is greater than would be possible without using power. Thus labour has been displaced, and, from one point of view this is a bad thing. On the other hand, I do not think that I could make a commercial success of farming without using power, and it is better that the farm should pay with a few men, rather than run at a loss with many. By adding further departments, I hope, eventually, to develop the resources of the farm and thus employ more men. The pig department I am now starting does not yet use any form of power and so cannot come within the scope of this article. One last point: it has been said that the wheat grower is only "on the dole." It is true that wheat without the Quota would hardly pay to grow at present prices, but there are other crops. The existence of the Quota simply makes wheat the most lucrative, and it would be foolish not to take advantage of it. Also, if ever a situation occurs again as during the last war, when it was extremely difficult to bring food into this country, then the money paid to farmers for growing wheat will be money well spent—as well spent for combine-harvesters as for battleships, and the Combine is a weapon of peace.

THE PRODUCTION OF HIGH-GRADE PIGS

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Pig Husbandry Research Station, Wye.

THIS station was started in 1924, the Ministry of Agriculture making a capital grant of £3,000 towards the initial cost of buildings and equipment and an annual grant for maintenance. Relatively little attention was paid to carcass quality in the early experiments. Under the Pigs and Bacon Development Scheme, however, it is now realized that if the British farmer is to capture a large share of the home bacon market his pigs must be of the right type. Further, the proportion of high grade pigs that will qualify for bonus payments is one of the most important of the factors that determine profit. It is, therefore, essential that the factors which determine the quality of the carcass should be studied.

Data accumulated during 1934 seemed to indicate that the two factors that have the greatest influence upon the quality of the carcass are (1) the type of pig, and (2) the intensity of feeding. The experiment discussed in this article was designed to obtain more definite information regarding the influence of these two factors.

Sixty-eight cross-bred pigs, all sired by the same Large White boar (Fig. 1), were used. They were a thrifty, well-reared lot, and all were treated in the same way before the experiment. The dams of thirty-eight were Essex Saddle Backs; these will subsequently be referred to as Type I (Figs. 2 and 3). The dams of the other thirty were Large Blacks, and this batch will be referred to as Type II (Figs. 4 and 5). There is no evidence to show that the pigs used in this experiment can be regarded as typical of the two crosses; they were no more than a random selection from the strains that are at present represented in this herd.

Two groups were formed, each containing seven lots of pigs, four of Type I and three of Type II. It was intended to have four lots of each Type but there were not sufficient pigs of Type II available. The pigs were divided into pairs at the time of sorting, the two pigs in each pair being from the same litter and as nearly the same weight as possible. One pig from each pair was placed in one of the lots of Group 1, the other into the comparable lot of Group 2. There were five pigs in each of the lots except Lot 8 and Lot 8A, which

THE PRODUCTION OF HIGH-GRADE PIGS

only contained four pigs. One pig had to be withdrawn from Lot 2, so that the figures for that lot are for four pigs. The average weight of each lot was as near as possible 100 lb. at the commencement of the experimental period, which lasted until the pigs were sent to the factory, each pig being despatched when it was as nearly 200 lb. live-weight as possible. The carcasses were inspected and measurements taken about two hours after slaughter.

Feeding. The rations are given in Table I.

TABLE I.

<i>Mixture in Parts by Weight.</i>			
		<i>Group 1.</i>	<i>Group 2.</i>
Weatings	.. ..	25 parts.	25 parts.
Bran	.. ..	5 "	5 "
Barley meal	.. ..	40 "	37½ "
Flaked maize	.. ..	20 "	20 "
Soya bean meal	.. ..	10 "	12½ "
Chalk	.. ..	1½ "	1½ "
Salt	.. ..	½ "	½ "
Containing dig. CP.	.. ..	12 per cent.	13 per cent.

The pigs were fed twice a day, the meal being soaked before feeding, and in order to ensure the correct quantity, the meal for each pen was weighed out and soaked separately. The pigs did not receive any meal on Sunday afternoons, but were given a limited amount of water. No green food was used, but ½ oz. per pig of a mixture consisting of three parts Epsom salts and one part nitre was given once a week as a corrective. It was put into the Monday morning feed. Group 1 received what may be described as a "standard" mixture; it contained 12 per cent. of protein and at all stages the daily intake of protein was above the optimum. If this ration had been used for Group 2 at times the daily intake of protein might have fallen below the optimum* and check given to flesh formation as a result. The proportion of soya bean meal and in consequence, the protein content, of the mixture fed to Group 2 was slightly higher than that fed to Group 1. This modification did not alter the starch equivalent to an appreciable extent, and it ensured that the daily intake of protein of the pigs of Group 2 was at all times above the optimum, but below that of Group 1.

Each lot was receiving 4½ lb. of meal per pig per day at the commencement of the experimental period. The pigs in Group 1 were fed in accordance with the normal practice of

* Ministry of Agriculture Bulletin No. 48: *Rations for Live Stock*, 7th edition, p. 64.

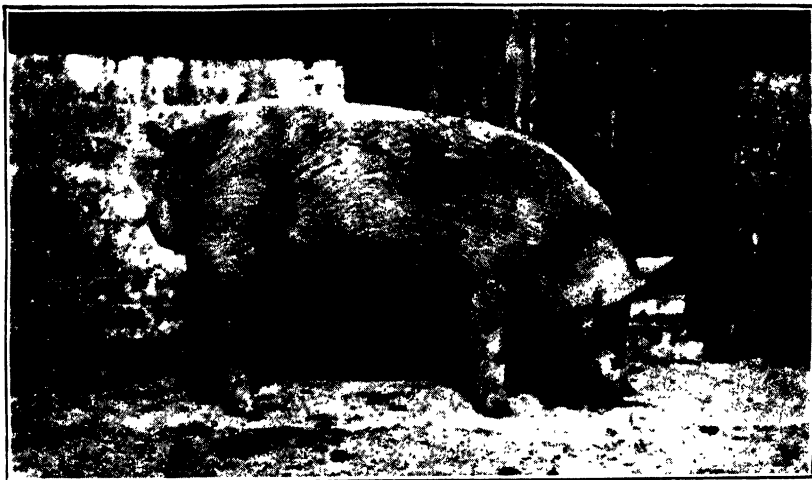


FIG. 1. Large White Boar (Crayvalley King David), sire of all the experimental pigs at Wye.



Photos. V. C. Fishwick.

FIG. 2.-- One of the lots from Group 1. (See Fig. 3).



FIG. 3. The comparable lot from Group 2 (See Fig. 2).



FIG. 4. One of the lots of Group 1 (See Fig. 5).



FIG. 5. The comparable lot from Group 2. (See Fig. 4).

Photos: V. G. Fishwick.

THE PRODUCTION OF HIGH-GRADE PIGS

this Station, that is to say, they received the quantity of food they would clear up readily; ten minutes after feeding the troughs were licked out clean and the pigs would have eaten a little more food if it had been at their disposal. It may be pointed out that many pig-keepers feed more intensively: pigs of 180-200 lb. live-weight frequently receive 9 lb. of meal per head per day. The maximum daily ration fed to the pigs of Group 2 was restricted to $5\frac{1}{2}$ lb. per head per day and the feeding was regulated in such a way that they did not receive that quantity until they reached 175 lb. live-weight. The quantities fed to the two groups were as follows:—

	<i>Group 1.</i> <i>Per head per day.</i>	<i>Group 2.</i> <i>Per head per day.</i>
At 100 lb. live-weight	$4\frac{1}{2}$ lb.	$4\frac{1}{2}$ lb.
At 150 lb. " " "	6 lb.	5 lb.
At 175 lb. " " "	$6\frac{3}{4}$ lb.	$5\frac{1}{2}$ lb.
At 200 lb. " " "	7 lb.	$5\frac{1}{2}$ lb.

Results. It was difficult to make a reliable comparison between the appearance of the pigs of the two groups whilst they were alive because those of Group 1 grew quicker, and in consequence were ready for the factory earlier than those of Group 2. Two lots from Group 1 and the comparable lots from Group 2 are shown in Figs. 2 to 5.

(a) Measurements and Grading of Shoulder Fat.

TABLE II.
MEASUREMENTS OF SHOULDER FAT.

<i>Group 1.</i>	<i>Average Thickness.</i>		<i>Group 2.</i>	<i>Average Thickness.</i>
<i>Type I.</i>				
Lot 1 (5 pigs)	1·91 in.	Comparable Lot 1A (5 pigs)	1·80 in.	
" 2 (")	1·80 in.	" " 2A (4 ")	1·65 in.	
" 3 (")	1·81 in.	" " 3A (5 ")	1·69 in.	
" 8 (")	1·81 in.	" " 8A (4 ")	1·66 in.	
Average Type I	1·83 in.			1·70 in.
Standard error of difference between two comparable lots:— $0\frac{1}{2}$ per cent.				
<i>Type II.</i>				
Lot 4 (5 pigs)	1·91 in.	Comparable Lot 4A (5 pigs)	1·85 in.	
" 5 (")	1·89 in.	" " 5A (")	1·88 in.	
" 7 (")	2·06 in.	" " 7A (")	1·98 in.	
Average Type II	1·95 in.			1·90 in.

Standard error of difference between two comparable lots:—14 per cent.

It will be seen from Table II that the effect of limiting the ration of the pigs in Group 2 was to produce a reduction in the thickness of the shoulder fat, in all of the lots; whilst the reduction was of considerable magnitude in the pigs of Type I,

THE PRODUCTION OF HIGH-GRADE PIGS

it was insignificant in those of Type II. It was also notable that there was a clearly marked difference in the thickness of the shoulder fat of the pigs of Types I and II, the latter carrying the greater thickness of fat. In view of the fact that all the pigs had the same sire, this difference was entirely due to the dams, and indicates the importance of selecting females of the right type when it is desired to produce high-grade bacon pigs.

The practical importance of these differences is shown by a comparison of the grading and financial returns from the different batches. There were only fifteen pigs of Type II in each Group, whereas there were 19 of Type I in Group 1 and 18 in Group 2, and in order to get comparable figures fifteen pigs were selected at random from the two groups of Type I.

The figures in Table III are based on the assumption that all pigs were 7 scores carcass weight, the price being taken at 11s. per score for a C grade pig (the average price for the year 1935 was 11s. 1½d. per score). The table also gives the grading (1935 standard).

TABLE III.—GRADING (1935 STANDARD).
VALUE (taking a Grade C pig at 11s. per score).

	Group 1.							Group 2.						
	Grade.					Value.		Grade.					Value.	
	A	B	C	D	E	£	s. d.	A	B	C	D	E	£	s. d.
Type I.														
15 pigs (random selection)	3	4	7	1	—	59	8 3	10	3	2	—	—	61	15 6
Type II.														
15 pigs	..	2	3	8	1	1	58 14 3	3	3	4	5	3	—	59 4 9

It will be seen that twelve of the thirty-six pigs in Group 1 qualified for the two highest grades, and that the number that qualified for these two grades rose to twenty in Group 2. The reduction effected in the thickness of shoulder fat of the pigs of Type I, Group 2, was sufficient to make an appreciable difference to the grading and value of this batch of pigs, but the small reduction in that of the pigs of Type II, Group 2, was not sufficient to make any practical difference.

(b) *Length of Feeding Period.* The result of limiting the ration of the pigs in Group 2 was to increase the length of the feeding period by about 14 days, the average number of days taken to produce 100 lb. live-weight increase being:—

	Group 1.		Group 2.	
Type I	..	77 days	89	days
Type II	..	79·7 "	94·5	"

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(c) *Meal Consumption.* The meal consumption has been worked out on the basis of increase in carcass weight, which has been taken at the commencement of the experimental period as being two-thirds of the live-weight. This estimate involves a small error, which, however, affects the comparable lots to the same extent. The figures are summarized in Table IV.

TABLE IV.—MEAL CONSUMED PER 100 LB. CARCASS INCREASE.

				Group 1.	Group 2.
Type I.					
Lot 1	..	..	468 lb.	475 lb.
„ 2	..	..	496 lb.	466 lb.
„ 3	..	..	490 lb.	514 lb.
„ 8	..	..	473 lb.	490 lb.
Average				481 lb.	486 lb.
Type II.					
Lot 4	..	..	517 lb.	494 lb.
„ 5	..	..	479 lb.	502 lb.
„ 7	..	..	512 lb.	534 lb.
Average				502 lb.	510 lb.

The figures show that there was no significant difference in the amount of meal consumed by the pigs of the two groups per unit in carcass weight gained.

It has been commonly accepted that the pigs that eat the largest daily rations, and consequently grow the fastest, give the best return for food consumed. The results obtained in this experiment indicate that this is not necessarily true. There was no difference in the economy of the meal consumption of the pigs of Groups 1 and 2 in spite of the fact that the former received the larger amount of food per day and had the shorter feeding period, whilst the amount of meal consumed per unit carcass increase by the pigs of Type II in Group 1 was actually greater than that consumed by those of Type I in Group 2 although the latter received the lower standard of feeding and had a feeding period which was ten days longer than the former. The figures for these two batches of pigs were:—

	Type II. Group 1.	Type I Group 2
Average number of days per 100 lb. live-weight increase	79	89
Average meal consumed per 100 lb. carcass weight increase	502	486
Average thickness of shoulder fat	1.95	1.70
B 2		239

THE PRODUCTION OF HIGH-GRADE PIGS

The reason for the higher meal consumption figures of the pigs of Type II is to be found in the carcass measurements. They were the fatter pigs, and it takes more food to produce a pound of fat than a pound of lean meat.

Practical Application of the Results. The results obtained in this experiment indicate that the factor that has the greatest influence upon the quality of the carcass is the type of pig. The superiority of the pigs of Type I over those of Type II shows the importance of the influence of the dam on the characters upon which the quality of the carcass depends. Where the production of high-grade pigs is the objective, breeders must start with sows of the right type.

The fact that twelve pigs in Group 1 qualified for the two highest grades indicates that there are pigs that on normal feeding will produce high-grade carcasses, and it is from such pigs that high-grade carcasses can be produced most economically. The object of breeders, therefore, should be to produce pigs of this type. It takes time, however, to effect modifications in "type," and where an unduly small proportion of high-grade pigs is being produced the system of "restricted feeding" during the second half of the feeding period practised with Group 2 is worthy of a trial *if the fault is a slight excess of back fat*. The modification will generally produce an appreciable improvement in the grading of the pigs from herds that contain a reasonably good bacon type of pig, such as those of Type I, but cannot be relied upon to improve the grading of the pigs from herds containing a "fatter" type of pig, such as those of Type II.

It is sometimes desirable to prolong the period of growth of a batch of pigs in order to comply with contract obligations. The results obtained show that by making a moderate reduction in the daily ration during the second part of the feeding period it is possible to prolong the period of growth by about a fortnight without increasing meal costs.

The writer desires to express thanks to Mr. H. Bescoby, the College statistician, for making a statistical analysis of the detailed figures, and checking the findings therefrom; the figures for the standard errors were provided by him.

THE CULTIVATION OF ASPARAGUS

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THE recent development of the canning industry has drawn attention to the production of asparagus for this purpose. Most of the canned asparagus consumed in this country is imported, chiefly from America. Imported canned asparagus is mostly white, that is to say, it is blanched almost to the tips of the shoots. Very little of this type is produced in this country, although most of the asparagus imported from the Continent is white. White asparagus can only be produced commercially by a sufficient covering of soil. When grown on the bed system, as is usual in this country, the soil covering has to be done by hand labour, thereby adding greatly to the cost of production. To enable earthing-up to be done by mechanical means it is necessary to grow asparagus on a method other than the bed system.

The following is a brief account of the establishment of an asparagus plantation on the Kirton Agricultural Institute farm, the object being to test a modification of the American method of single row culture, and to obtain costs of production and returns. As the method has so far proved successful, it is thought that growers may desire to try it themselves, and that the information so far available will be welcome.

The Seed Bed. Seed was sown on well-prepared light sandy soil on April 29, 1932. To mark the rows at an early date, and thereby enable hoeing to be done, a small quantity of lettuce seed was mixed with the asparagus seed. The seed was sown by means of a hand drill at the rate of 7 lb. per acre. The rows were 1 ft. 3 in. apart, and the total area of the bed was just under half an acre. This provided ample plants for a plantation of 5 acres, and permitted of careful selection of good roots for planting. None of the plants flowered the first year.

Preparation of the Land for Planting. Although the field was naturally dry, pipe drains were put in to ensure efficient drainage. The land was then ploughed 10 in. deep and subsoiled a further 8 in.

Preparations for planting commenced in the last week in March, 1933, the crowns at that time just beginning to show

THE CULTIVATION OF ASPARAGUS

signs of growth. It was considered advisable not to move the plants until this stage was reached. Planting was actually done between March 31 and April 4, 1933.

The land was dragged several times and harrowed to obtain a reasonably fine tilth. It was decided to allow a distance of 4 ft. 6 in. between the rows. As will be explained later, this distance is likely to prove too narrow. The field was then ridged by means of a three-row ridger as for potatoes. The crowns were planted in each alternate furrow. This method was considered better than drawing a furrow every 4 ft. 6 in. with the ridging plough, and it had the advantage of ensuring that all the rows were parallel.

The bottom of each alternate row was then levelled by means of a hand rake. This provided a level surface on which to place the plants, and enabled the roots to be laid out horizontally.

Selection of Roots for Planting. The roots were lifted from the seed-bed with hand forks. Only those showing strong, stout buds were selected for planting, the others being discarded. The statement that male plants produce a heavier crop than female plants was known, but no experimental evidence was then available to prove the statement. (Experiments in Worcestershire by Mr. Gaut and at Wisley by the Royal Horticultural Society,* have since shown the statement to be justified). As the seedling plants had not flowered the first year (and apparently do not do so in England), sex selection was not possible unless planting was to be delayed for a year.

Planting. The selected crowns were placed by hand at a distance of 15 in. apart in the prepared furrows. The roots were laid out horizontally and a small quantity of soil drawn over them by hand from the adjoining ridges. This was done to keep them in position during the operation of covering, which was done by splitting the ridges on either side of the plants by a ridging or double mould-board plough. The intervening ridges between rows were then levelled. This left the land ridged over the plants in each row.

Subsequent Treatment. After about ten days, when the surface weed seeds had germinated, the whole field was lightly harrowed. This reduced the ridges over the plants to about half their previous height. Subsequent treatment con-

* Jour. R.H.S., Vol. LX, Part 10, Oct., 1935.



FIG. 1 Drawing the ridges with a three-row ridger (N.B. The ridges were completed before this photograph was taken)



FIG. 2. Levelling the bottom of the furrow before planting.



Photos : J. C. Wallace.

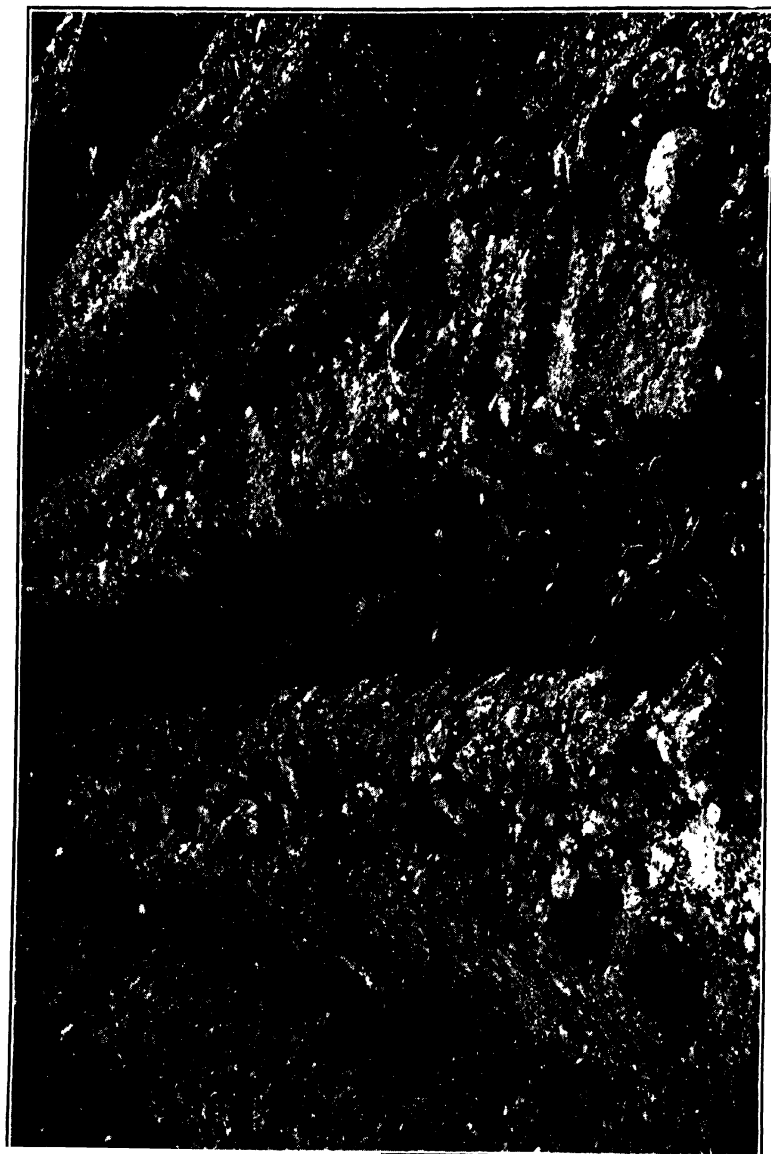


Photo · J. C. Wallace.

FIG. 4.—The plants in position. The soil has not been drawn over those shown.

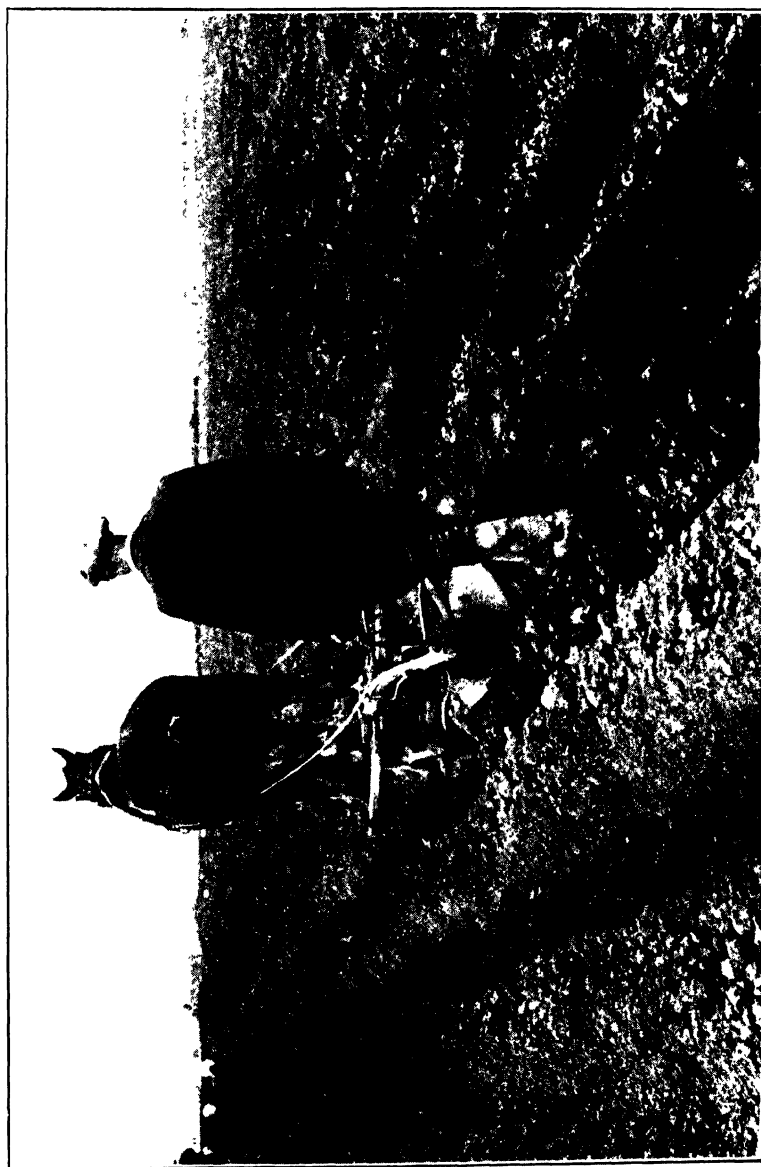


Photo J. C. Wallace.

FIG. 5.—Splitting the ridges to cover the plants. The plants being covered are in the furrow to the right of the plough



FIG. 6 Levelling the unwanted ridge.



Photos: J. C. Wallace.

FIG. 7.— After ten days, the whole field was harrowed.

THE CULTIVATION OF ASPARAGUS

sisted of cultivating between the rows, working as near to the plants as possible without disturbing the roots. The weeds appearing in the rows between the plants were removed by horse hoeing, but those near to the young growth had to be removed by hand. Opportunity was taken to carry out experiments on the chemical control of such weeds and it was found that calcium cyanamide was effective without causing damage to the asparagus growth. (See this JOURNAL, Vol. XLI, No. 10, January, 1935.)

Similar treatment was given to the field in 1934. Very strong growth was made in that year. High winds blew over some of the stems. This might have been largely prevented if the soil had been drawn over the rows, i.e., if the plantation had been ridged.

Owing to the impossibility of horse cultivation between the rows, weeds had made some headway by the time the foliage had died in the winter of 1934-35. After the dead foliage had been removed, the weeds were easily destroyed by running the plough down and up between each two rows. On the downward journey the soil on the right half of the inter-row was thrown over on to the row itself, and on the return journey, that on the other half was thrown on to the other row. This buried the weeds and at the same time formed a ridge over the plants. Early in March, 1935, the ridges were well harrowed, to obtain a fine tilth over the plants. A fortnight later, more soil was thrown up on the ridges by a colonial type of inter-row disc harrow. This implement straddles the ridge, has three adjustable large discs on either side, and is drawn by two horses. A week later, inverted chain harrows were run along the ridges to break up the lumps of soil. The disc harrow was subsequently used at intervals, and it not only threw up more soil on the ridges but the frequent moving of the soil kept down all weeds.

Cutting commenced on April 22, 1935, and was discontinued on June 6, as it was desired not to cut too severely during the first season. During the cutting season, weeds made some little headway along the top of the ridge. About mid-way through the cutting season these were got rid of by pulling down the top of the ridge, using a wide-toothed hand-rake. This operation was done immediately after the beds had been gone over and cut. Fortunately, the weather was dry, and the weeds had died by the end of the second day. The disc harrow was again used to remake the ridges.

THE CULTIVATION OF ASPARAGUS

Wider Spacing Necessary. In American single-row plantations, the rows are spaced 8 ft. apart. As the soil at Kirton is very fertile, it was considered that much closer spacing of the rows would be more economical, and 4ft. 6 in. was decided upon. There is no doubt that the land is capable of carrying a crop spaced at this distance. It has been found, however, that not only have the roots grown into the centre of the inter-row, but that it is difficult to get sufficient soil to produce the required length of white asparagus. At the moment when the market favours green asparagus the matter may not appear very important. Six-feet between the rows is suggested as a more suitable distance.

Marketing. The crop was packed according to National Mark standards, and good prices were realized.

General. After planting, in April, 1932, some of the roots were attacked by *Penicillium*, the result being a number of blanks in the field. To make good these losses, slightly over one acre of the field was lifted in late March, 1934, and the plants reset in the blank spaces in the remainder of the field. The portion thus set free was resown with asparagus seed, the intention being to test the possibility of growing the plants *in situ*. The season, unfortunately, was dry and the germination was irregular. The plants in this portion have done badly in comparison with those in the remainder of the field. This may of course be due to the two very dry seasons of 1934 and 1935. The method appears to have little to recommend it.

Costs. The costs per acre for the first three years, i.e., from the preparation of the land for the seed-bed to the end of March, 1935, were as follows:—

Land preparation, including proportion of under-draining on 15-year principle, seeds, dressings, etc.					£	s.	d.
Rent (2 years)					18	2	1
Overheads					14	0	0
					3	0	0
					<hr/>		
					£35	2	1
Disc harrowing April 1 to June 6, 1935 ..					1	11	3
Rent, etc					2	5	0
Cutting and packing, cartage, crates, delivery charges, etc.					13	3	0
					<hr/>		
					£52	1	4
					<hr/>		

This amount was recovered by sales between April 22 and June 6, 1935.

FLOCK PERFORMANCE SCHEME AND EGG YIELDS IN OXFORDSHIRE

A. BRIDGES, M.A.,

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POULTRY-KEEPING has never been highly developed in Oxfordshire. In 1921, the density of poultry per 1,000 acres of crops and grass was 744, compared with 949 for England and Wales and 2,980 for Lancashire. As to particular parts of the county, an economic survey of the arable Cotswold area, in 1922, by Vaughan, showed that the numbers of fowls in that area was 460 per 1,000 acres;* in a similar survey, in 1923, by Bridges and Dixey in South Oxfordshire, where dairying was of great importance, the number was 437 per 1,000 acres; and in the Chiltern area and around Reading, surveyed by Imper and Lewis in 1924, it was 471. In most districts, more poultry were kept, in relation to area, on the small farms than on the larger holdings; for example, in the South Oxfordshire area, the density was 1,550 per 1,000 acres on farms under 50 acres, and was less than 400 per 1,000 acres on farms over 300 acres.

Although, in all districts, there was usually some increase in the *actual* numbers of fowls *per farm* on large farms as compared with small farms, it was not particularly large and demonstrated the fact that poultry-keeping was not regarded as an important part of the farming but as something of a side line, the extent of which was mainly determined by the spare time of the farmer's wife or some other member of the family.

The general method of production followed in the county about the time of these surveys might be described as barn door and occasional stubble folding, and it was not to be wondered that, with indifferently-bred stock and poor egg performance, some farmers were inclined to condemn poultry-keeping as an enterprise not worthy of their attention.

* The Economics of Production on Grass and Arable Farms. H. J. Vaughan (*Jour. R.A.S.E.*, Vol. 85, p. 225, 1924).

FLOCK PERFORMANCE SCHEME, OXFORDSHIRE

Throughout the county, a number of specialist poultry holdings on small acreages developed after the War, where fairly high standards of production were achieved. Troubles with disease, and difficulties of buying and selling, hampered a good many of the smaller of these specialists; while their businesses were not, in any case, sufficiently large to give them a reasonable livelihood even under the best of conditions: consequently numbers of them gave up.

Since that time, poultry-keeping in the county has increased. In 1929, the number of fowls rose by 50 per cent., and the density by 56 per cent. to 1,157 per 1,000 acres of crops and grass. By 1934, a further increase had taken place, and the number of fowls in the county was rather more than double what it was in 1921, while the density was 1,605 per 1,000 acres of crops and grass, an increase of 116 per cent. A notable feature of the increase was the development of poultry-keeping on many of the larger farms of the county.

Although, by 1929, the increase was impressive, it compared poorly with that in Lancashire, where the density per 1,000 acres had risen by 139 per cent. over the figure of 1921, and that Oxfordshire had not kept pace with average progress is illustrated by the density of poultry in England and Wales in that year, when it was 77 per cent. greater than that of 1921, compared with an increase of 56 per cent. in Oxfordshire.

TABLE I.—NUMBER OF FOWLS AND DENSITY PER 1,000 ACRES IN ENGLAND AND WALES, OXFORDSHIRE AND LANCASHIRE, 1921, 1929 AND 1934

	1921		1929		1934	
	No. of fowls	Index	No. of fowls	Index	No. of fowls	Index
England and Wales ..	24,816,385	100	42,756,765	172	61,329,893	247
Oxfordshire ..	302,899	100	454,783	150	625,122	206
Lancashire ..	2,267,238	100	5,102,985	225	7,611,865	336
Density per 1,000 acres of crops and grass						
England and Wales ..	949	100	1,677	177	2,450	258
Oxfordshire ..	744	100	1,157	156	1,605	216
Lancashire ..	2,980	100	7,088	239	10,944	367

The reasons for the comparatively slow progress in Oxford-

FLOCK PERFORMANCE SCHEME, OXFORDSHIRE

shire at this date are difficult to determine. The population of the City of Oxford was expanding rapidly, the drift of people to London and to the districts immediately to the west of it, and the growth of population in the Birmingham area, were factors giving considerable strength to markets for farm produce, and particularly for eggs, in Oxfordshire. The lack of well-distributed and organized selling points, perhaps the absence of strong distributing agencies, and the relative slowness of Oxfordshire farmers to grasp the opportunities of a rapidly-expanding and accessible market for eggs, may, together, have been the causes of the lag in development.

During 1928, the Agricultural Education Committee of the County Council decided to give greater emphasis in their educational work to questions of egg production. Part of this work consisted of a Flock Performance Scheme. One of the objects of this scheme was to stimulate an increase in the production of eggs on general farms and small holdings, where it was believed that most benefit would accrue from the work. It was extremely doubtful if the yield of eggs on these types of farms at this date was more than 100 per bird per annum, the income from which was regarded as being sufficient only to pay for the maintenance of the flocks, and did not provide any margin for profit. By attention to management it was thought that this yield could be appreciably increased.

The farmers co-operating in the scheme were to keep systematic records of egg-yields, and with this was coupled a periodic inspection of the flocks by the County Poultry Instructress for the purpose of checking the records, suggesting methods of improvement in breeding, and of giving advice on general management. The merit of the advisory part of the scheme was the constant contact made with the co-operating farmers. Very few will deny that the educational effect of this method is much greater than is usually obtained by dealing with casual or spasmodic inquiries.

The Scheme started on October 1, 1928, and has been running ever since. The number of flocks recorded for egg yields has varied from year to year. The number was 81 in 1928-29, 95 in 1929-30, and it has been between 60 and 70 in the last 4 years. In the earlier years, some farmers were testing the merits of different breeds for their particular environments; with more definite guidance from the records they have now concentrated on one and sometimes two breeds. This has, naturally, reduced the number of flocks recorded.

FLOCK PERFORMANCE SCHEME, OXFORDSHIRE

Some farmers have also dropped out on shifting to other areas and for other reasons.

Although the sample of farms, therefore, may not be uniform as to the kinds of breeds, or the number and capacity of farmers represented each year, it cannot be said that the improvements in yields, which are shown in Table II, are due to the elimination from the scheme of poor flocks or of poor managers, since both good and bad have been lost, while new entrants have tended to counteract improvement tendencies in the yield averages. Table II gives the average egg yields per bird for the 6 years 1928-29 to 1933-34. It has been divided to show the yields of pullet and hen flocks separately, and for each in turn the production of the 3 highest-yielding flocks and 3 lowest-yielding flocks in each year is also shown.

TABLE II.—EGG PRODUCTION PER BIRD PER ANNUM
1928-29 TO 1933-34

Years	Pullets			Hens		
	3 Highest- yielding flocks	3 Lowest- yielding flocks	Average	3 Highest- yielding flocks	3 Lowest- yielding flocks	Average
1928-29 ..	195·9	105·7	140·0	141·9	79·0	113·5
1929-30 ..	193·1	107·1	147·5	179·7	88·5	127·8
1930-31 ..	194·0	96·6	149·2	178·8	85·9	127·0
1931-32 ..	205·1	94·7	146·0	209·6	89·8	134·2
1932-33 ..	184·9	80·6	156·2	160·7	102·5	125·6
1933-34 ..	207·9	114·9	158·7	163·0	102·1	130·5

The yield of pullet flocks rose steadily from 140·0 eggs per bird 1928-29 to 158·7 eggs per bird in 1933-34, an increase of some 13 per cent. In the hen flocks, the yield rose quite appreciably from 113·5 in the first year to 127·8 in the second year, but there has been no marked change since, though the yields show a slight tendency to rise; the average yield of eggs from hens in 1933-34 was 130·5. There is a general reluctance among poultry farmers to cull pullets as hard as they should, with the result that poor layers are often kept on into their second year as hens. This factor has tended to keep down the yield of hen flocks and may be responsible for the very slow improvement in yields of these flocks after 1929-30.

The tendency to a general improvement in egg yields is

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seen also from the gradual diminution of low-yielding flocks (Table III). The percentage of flocks with yields of less than 120 eggs per bird per annum fell from 38·3 in 1928-29 to 16·4 in 1933-34.

TABLE III.—DISTRIBUTION OF FLOCKS WITH DIFFERENT EGG-YIELD LEVELS, 1928-29 TO 1933-34 (All flocks)

Eggs per bird per annum	Percentage of Flocks					
	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34
Below 120 ..	38·3	33·3	27·4	15·1	17·6	16·4
120-139 ..	30·9	23·2	23·2	23·3	26·3	21·3
140-159 ..	18·5	30·4	22·1	21·9	21·0	27·9
160-179 ..	7·4	5·8	16·8	19·2	24·6	22·9
180-199 ..	3·7	4·3	10·5	13·7	10·5	8·2
200 and over	1·2	3·0	—	6·8	—	3·3
	100·0	100·0	100·0	100·0	100·0	100·0

It is not possible, from the records available, to give reasons for the improvements shown in the average yields, but the County Poultry Instructress, who has kept contact with the farmers during the operation of the scheme, is satisfied that the flocks are generally now much better managed than formerly. Culling, although still far from perfect, especially among pullets, is much more rigorously done, greater attention is paid to the selection of breeding stock, both where breeding is done on the farm and where flocks are replenished by purchase, and the rationing of foods is more carefully arranged.

The figures given in Table II indicate that good average yields, both from pullets and hens, can be secured on general farms where attention is given to the management. There is little excuse for, and probably little profit in, flocks yielding about 100 eggs per bird per annum, which was the County Organizer's estimate of the average yield in the county in 1928. There are probably still many flocks in the county to-day that do not rise above this average.

The results of six pullet flocks, which have been recorded throughout the whole or greater part of the period of the scheme, also illustrate the improving tendency due to better management.

Naturally, there is more variation from year to year in the yields of the individual flocks than in those of the general

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TABLE IV.—YIELDS PER BIRD PER ANNUM ON SIX PULLET FLOCKS, 1928-29 TO 1933-34

Farm	Breed	Number of Eggs					
		1928-29	1929-30	1930-31	1931-32	1932-33	1933-34
A	Exchequer Leghorn	127	— ¹	129	141	— ¹	163
	Rhode Island ..	—	—	123	170	— ¹	149
B	White Leghorn ..	145	159	162	182	184	168
	Rhode Island ..	134	154	134	185	157	182
C	White Leghorn ..	175	158	164	174	181	144
	White Leghorn ..	126	167	146	140	155	185

(¹) Pullets not separately recorded in this year.

averages given in Table II. An outbreak of disease—as for example on farm C in 1933-34, when the land on which the birds were kept was found to be fowl sick—or occasional illnesses of persons responsible for the flocks, breaking the continuity of management, make for temporary set-backs that are obscured in the general average figures.

The existence of low-yielding flocks in each year, shown in Tables II and III, is explained partly by experiments by some farmers with new breeds or crosses, by new entrants into the scheme, and by the continuation in it of those who have not been able or willing to effect any improvement in their methods. Those who have been testing out various breeds of poultry find that accurate recording of yields is the only means by which to obtain reliable comparative information of the merits of the system practised. One farmer, for example, used his records for this particular purpose. In 1930-31, he introduced a pullet flock of a certain breed for the first time in order to test its performance under folding methods on arable land. The result was a yield of 62 eggs per bird and so they were at once given up. Another farmer tried a well-known sex-linked cross in 1931-32, but his yield was the unsatisfactory one of 87 eggs per bird. The yield output was never at any time above 30 per cent. The same cross was given a second trial in the following year, and, although there was an improvement on the first year's figures, the yield was again disappointing, being only 104 per bird.

Many new entrants to the scheme had never realized how bad their yields were until they kept records of the eggs laid. This is no new experience where live-stock records have been taken up. The low-yielding flocks were not confined to any

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particular breeds, and, apart from the exceptional circumstances noted above, the poor results must be attributed to low natural capacity of the stock, to unsatisfactory housing conditions, and to poor general management.

The difference in the yields of the best over the poorest flocks was often more than 100 per cent., both in pullet and in hen flocks, and was never less than 56 per cent. (see Table II). In terms of monetary return, based on the average monthly prices prevailing in the county in each year, the difference in favour of the best-yielding flocks was from 8s. 7d. per bird in 1933-34 to 15s. 8d. per bird in 1930-31 among pullet flocks, and from 6s. 2d. in 1933-34 to as much as 14s. 8d. per bird in 1929-30 among the hen flocks (Table V).

TABLE V.—YIELD OUTPUTS OF THREE LOWEST-YIELDING FLOCKS EXPRESSED AS PERCENTAGE OF THOSE OF THREE HIGHEST-YIELDING FLOCKS, 1928-29 TO 1933-34.

Year		Oct., Nov., Dec.	Jan., Feb., March	April, May, June	July, Aug., Sept.	Whole Year	Income difference per bird per annum in favour of three highest- yielding flocks
Pullet flocks							s. d.
1928-29	..	44	63	58	49	54	13 6
1929-30	..	14	50	83	64	55	13 7
1930-31	..	14	50	72	65	50	15 8
1931-32	..	18	50	63	56	46	12 2
1932-33	..	8	50	56	73	43	11 2
1933-34	..	55	64	56	41	55	8 7
Hen flocks							
1928-29	..	42	56	58	61	56	9 4
1929-30	..	31	47	62	39	49	14 8
1930-31	..	28	56	60	46	48	12 3
1931-32	..	22	48	50	52	43	12 5
1932-33	..	67	53	67	71	63	6 7
1933-34	..	39	58	71	77	63	6 2

At all periods of the year, the yields of poor flocks fell very far short of those of the good flocks. Figures illustrating this point are given in Table V where the yields of the 3 lowest-yielding flocks are expressed as a percentage of the yields of the 3 best flocks in each quarter of each year. It will be observed that it is in the quarter October—December, when egg prices are usually at their best, that the performance of

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the low-yielding flocks is at its worst. The figures suggest that they are essentially spring and summer layers, although even at these times their yields are extraordinarily poor.

The yield records have also provided the co-operating farmers with a guide to the problem of the correct proportions of pullets and hens in poultry flocks. This is essentially a question of comparative yields of eggs from pullets and hens, of the distribution of the egg yields of each, of prices of eggs throughout the year, and of the extent of depreciation in the pullet and hen years respectively. In Table VI, where the average difference, in each year, of the yields of eggs from pullets and hens is shown, the balance is always in favour of the pullets. The average difference in their favour was highest in 1932-33 (30.6 eggs per bird), and lowest in 1931-32 (11.8 eggs per bird).

Curves showing the distribution of egg yields of hens and pullets are shown in the attached graphs. The first is for the three years 1928-29 to 1930-31, where the yields are given

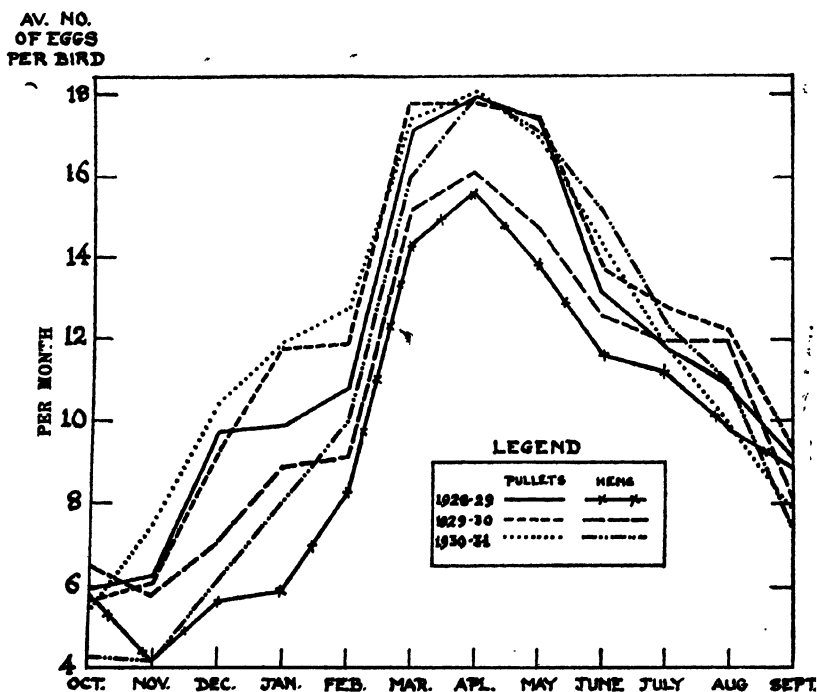


Fig. 1.—Monthly distribution of the egg-yields of pullets and hens, 1928-29 to 1930-31.

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AV. NO.
OF EGGS
PER BIRD

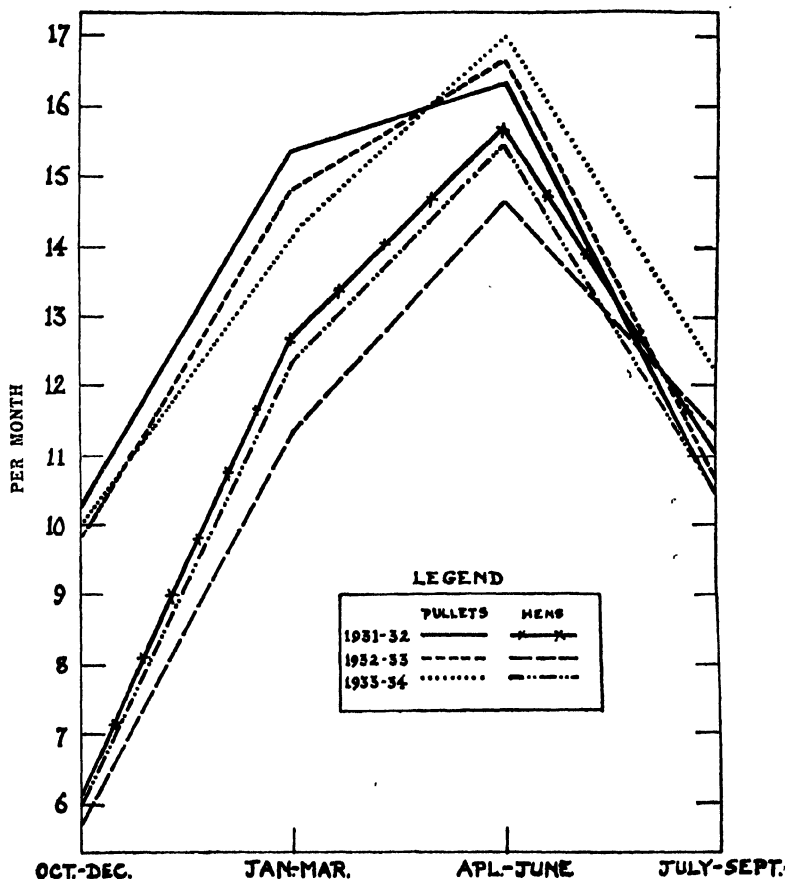


FIG 2.—Quarterly distribution of the egg-yields of pullets and hens, 1931-32 to 1933-34.

on a monthly basis, and the second for the next three years, where, unfortunately, only a quarterly distribution is available. The yield of eggs from hens may be said to fall short of that from pullets throughout the whole of the year, except in the late summer months, when yields from the two classes are very similar. It falls particularly short in the months of October to March, but hen eggs at this period grade higher than pullets and are on that account valuable in improving the grade of eggs sold during this time.

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TABLE VI.—AVERAGE ADVANTAGE, IN YIELD AND MONEY INCOME FROM EGGS, OF PULLET OVER HEN FLOCKS

Year	Average difference in egg yields in favour of pullets per annum	Average income pullet flocks per annum	Average income hen flocks per annum	Advantage in income of pullets over hens per annum
	No.	s. d.	s. d.	s. d.
1928-29	26·5	20 5	16 3	4 2
1929-30	19·7	20 2	17 7	2 7
1930-31	22·2	19 0½	15 10	3 2
1931-32	11·8	16 2	13 3½	2 10½
1932-33	30·6	15 1	11 9	3 4
1933-34	28·2	14 10	11 9	3 1

Translated into money values, the *yearly* differences in yields were worth 4s. 2d. in 1928-29, 2s. 7d. in 1929-30 and, in subsequent years, were about 3s. per bird.

Pullets may be valued at 6s. per head when they enter the flocks, and at the end of their first year, a figure of 2s. 6d. per head is a fair estimate of their value. The depreciation of pullets, therefore, may be put at about 3s. 6d. per bird. The selling value of hens during and at the close of their second year may be from 1s. 6d. to 2s. 6d. a head, with an average depreciation, therefore, of say 6d. per head. It follows that the income from eggs during the pullet year, must be greater than that of the hen year by over 3s. (depreciation pullet year 3s. 6d. less depreciation hen year 6d. = 3s.) if it is to be worth while to maintain flocks comprised wholly or mainly of pullets. The opinion of the co-operating farmers—and the figures of Table VI support it—is that the advantage at present is not sufficient to justify this practice.

Other estimates also suggest that there is little or no advantage in flocks with a high proportion of pullets. It is not surprising, therefore, to find that the co-operating farmers have been moving to flocks with smaller proportions of pullets than has hitherto been regarded as desirable. This policy avoids the necessity of raising so many chickens to replenish the flocks. A higher proportion of hen eggs to pullet eggs in the farmers' sales basket is also obtained, and this is of some advantage in the first few months of pullet egg production.

It is not suggested, of course, that this practice is or should be followed with all flocks. For example, those that are being improved must of necessity contain a high proportion of pullets to facilitate a more rigorous selection of stock.

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These brief notes on the recording and advisory work of the Oxford County Council demonstrate the usefulness of the scheme as a practical instrument in obtaining progress in poultry management. The farmers, as a whole, are satisfied that they have benefited from it. It has given them a measuring rod by which to gauge their actions. The advisory service, by periodical visits to the farms, contemporaneous with the keeping of the records, has been even more valuable, and is much appreciated by the co-operating farmers. Poultry-keeping in the county of Oxfordshire has maintained a rather better rate of progress in the period 1929-1934 relative to the country as a whole, and to Lancashire, than it did in the period 1921 to 1929.

The most prevalent breed of poultry in the county is the Rhode Island Red. This is partly a result of changes in methods of housing and partly on account of the suitability of this breed to environmental conditions in the county. The slatted floor house has been introduced widely on general farms, and the light breeds, such as the White Leghorn, are less satisfactory producers in this type of house, particularly on the clay lands. Many farmers claim that the slatted floor house is not so good for winter eggs as a colony house, which has a floor and perches, and can be moved. The folding unit is also being tried. Perhaps the feature of housing is the great diversity of houses in use and it seems that an attempt at standardization for particular conditions is highly desirable, both in the interests of economy of capital and better standards of egg production.

THE CHRYSANTHEMUM LEAF MINER AND ITS CONTROL

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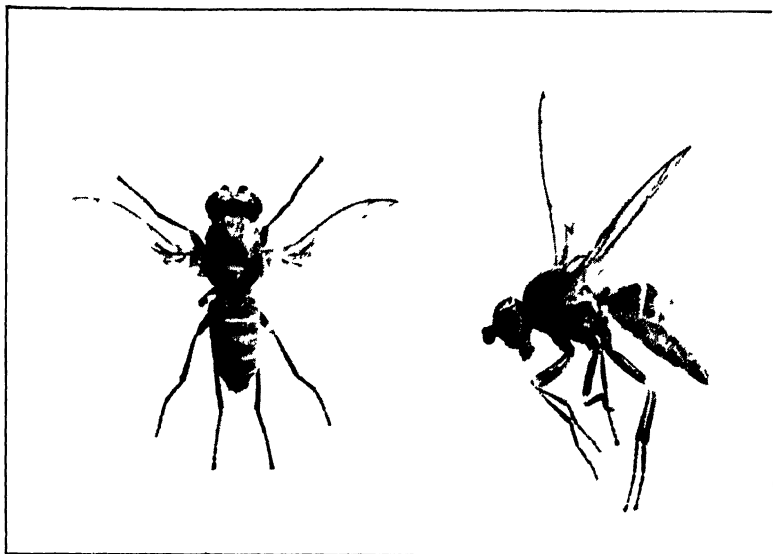
YEAR after year, the Chrysanthemum Leaf Miner (*Phytomyza atricornis* Mg.) has been recorded as doing serious damage to chrysanthemums and cinerarias. In recent years, severe injury has been recorded from the Cambridge district, Surrey, Kent, Lincolnshire, the Lea Valley, North Wales, Yorkshire, Lancashire and Cheshire.* During 1935, attack was particularly severe, and the insect was recorded as unusually abundant all over the British Isles. In view of the persistence of the insect in the north-west of England, investigations were begun at Manchester University, and the present account summarizes the results so far obtained.

Description and Life History. *Phytomyza atricornis* Mg. is about one-tenth of an inch long and resembles a miniature house-fly. It is sombre grey in colour and the abdomen is cream coloured on the under surface (Fig. 1). The fly has no common name, probably because it is only observed in the larval stages.

The flies may be found about the under sides of leaves of rooted plants and cuttings. They are not very active and take only short, jerky flights from one plant to another. Females pierce the leaf tissue with the ovipositor and feed on the sap that exudes from the punctures, but males are unable to pierce the leaves and feed only at incisions made by females.

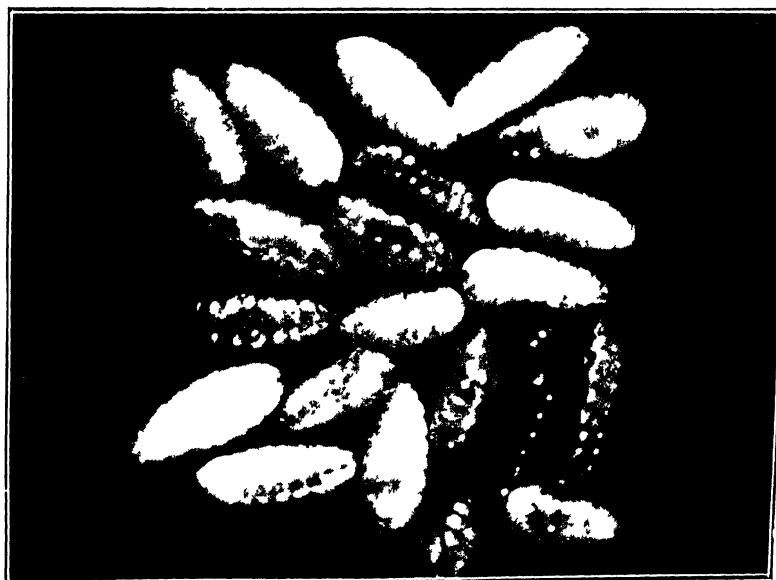
Egg-laying begins some hours after emergence and each female is capable of laying 50-100 eggs. The eggs are narrowly elliptical, about a seventy-fifth of an inch long, and translucent white in colour. They are inserted deeply into the under sides of the leaves so that they are entirely hidden from view. Usually 2-3 eggs are found in a leaf, but at times of heavy infestation there may be 15-20 eggs in a leaf. When the average temperature is 67° F. the maggots hatch from the eggs in four days.

(Ministry of Agriculture. Plant Pathological Dept., Monthly Report.)



Copyright Photo H. W. M. L.

FIG. 1. Adults of the Chrysanthemum Leaf Miner



Copyright Photo M. Cohen

FIG. 3. Puparia of the Chrysanthemum Leaf Miner dissected out of the mines
(Illustrations from *Insect Pests of Glasshouse Crops*)



Copyright Photo: H. W. Miles.

FIG 2. Chrysanthemum leaf, showing feeding punctures of adult flies and a mine made by the Leaf Miner. The tissue has been broken to reveal the maggot. (From *Insect Pests of Glasshouse Crops*.)

THE CHRYSANTHEMUM LEAF MINER

Immediately after hatching the minute legless maggots begin to mine the leaf tissue. They feed between the upper and lower surfaces of the leaves, and generally work their way towards the upper surface. Within the mine the larva lies on its side and rasps away the green tissue with its mouth hooks. The mines (Fig. 2) are narrow at first, but as the maggots increase in size the mines become broader and are usually tortuous. The larvae moult twice within the mines and reach maturity after feeding for 10-11 days.

When fully fed the larvae are about one-seventh of an inch long. They are legless, semi-transparent, greenish-white maggots, narrow and pointed towards the head, and with the body truncate at the posterior end. The head is very small and may be retracted within the body and the black mouth hooks are visible through the integument.

The mines usually terminate near the under surface of the leaf, and there the mature larva excavates a chamber in which to pupate. The pupa is formed within the larval skin, which shrinks and hardens to form a protective case or puparium about one-eighth of an inch long (Fig 3). The anterior spiracles project through the lower epidermis of the leaf to allow the insect to breathe. Only a few puparia are found near the upper leaf surface. The pupal period is very variable and lasts 9-13 days when the temperature is 67° F. At lower temperatures the pupal period is further prolonged.

When the fly is ready to emerge, the puparium splits along each side of the anterior end, and the fly forces its way out of the puparium, and breaks through the epidermis of the leaf to escape into the air.

The average period, from the laying of the egg to the emergence of the adult, is about 26 days. Females kept in the presence of the host plants live for as long as 17 days, but males live only about 4 days, since they are unable to feed except at punctures made by the females.

It is probable that six or more generations of Chrysanthemum Leaf Miners are produced in a year. In the early part of the year, the generations are quite distinct, but as the season progresses the generations overlap considerably.

Plants Attacked and Nature of Damage. All the cultivated varieties of chrysanthemums, cinerarias and marguerites are attacked by the Chrysanthemum Leaf Miner, and the chrysanthemum varieties Jean Pattison, Golden Marvel,

THE CHRYSANTHEMUM LEAF MINER

Pink Delight, Sandown Radiance and May Wallace seem to be particularly susceptible. In addition, some 70 species of non-cultivated plants and weeds are attacked. The host plants include many different plants belonging mainly to the family *Compositæ*.

The outstanding injury is that caused by the larvae, which live between the upper and lower surfaces of the leaves and devour the green tissue along winding tunnels or mines that broaden as the larvae increase in size. When two or more larvae occur in a leaf the whole of the green tissue may be eaten and the leaf destroyed, and occasionally the larvae work their way into the stems of young plants after they have destroyed the leaves.

A less prominent type of injury is associated with the feeding punctures made by the female flies. After piercing the tissue with the ovipositor, the flies suck up the sap that exudes from the punctures, and leave tiny bleached areas that later become calloused. These tiny calluses disfigure the leaves and are sometimes mistaken for capsid or frog-hopper injury.

Damage by the Chrysanthemum Leaf Miner is most severe during the propagating season, when infestation may affect over 90 per cent. of the cuttings in beds and boxes. The shoots may have every leaf attacked, and in some instances all the leaves are completely destroyed and only the stems show any green tissue.

When cuttings have rooted and are placed in frames, the attack by leaf miners may cease for a short time. Soon, however, the newly-established plants attract the flies that have developed on weeds and wild members of the chrysanthemum family, and a new infestation develops. Attack by subsequent generations of flies goes on throughout the summer, and intensity of infestation may not begin to decline until late in August. By this time most of the lower leaves of the plants are bleached and destroyed by the mines of the larvae and the upper leaves are marked by the feeding punctures of the females.

When the plants are brought under glass for flowering, attacks may begin again. At first they are not severe but they increase gradually and may cause noticeable injury to the very late-flowering varieties. Attacks under glass usually reach their height about the time the grower is taking cuttings for the following season.

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Control Measures. The Chrysanthemum Leaf Miner suffers much from the attacks of parasites belonging to the order Hymenoptera. The parasites are minute wasps, chiefly belonging to the family *Braconidæ*, and they feed and develop within the bodies of the fly maggots. In one instance, on the variety May Wallace, 98 per cent. of the puparia of the leaf miners were parasitized. Although the parasites exercise some control over the numbers of flies in the subsequent generation, the larvae complete their development and pupate before they are destroyed. As a result the parasites cause no reduction in the amount of injury to the foliage at the time of parasitism; consequently this natural means of control must be supplemented by artificial methods.

Light fumigations with nicotine or with hydrocyanic acid gas will destroy the flies, and the use of nicotine dust is also fatal to them.

Experiments with Cuttings. In the spring of 1935, cuttings were sprayed with a soap and nicotine spray consisting of $\frac{3}{4}$ oz. of nicotine (98 per cent. purity) and $\frac{1}{2}$ —lb. of soft soap in 10 gal. of water. In spraying, the cuttings were thoroughly drenched and care was taken to wet both sides of the leaves. Flies, eggs and early stage larvae were destroyed by the spray, but puparia were unaffected. Applications of the spray were made at intervals of about ten days, and this routine treatment proved effective in reducing the injury and entirely eradicating the flies.

Experiments on Plants out of Doors. In the early summer of 1935, experiments were carried out at the Lancashire County Council Horticultural Station on large plots of plants growing out of doors. The substances used were naphthalene-silica dust, sulphur dust, nicotine dust and nicotine sprays. The dusts were applied with a dust distributor and both surfaces of the leaves were covered. On the sprayed plots the plants were thoroughly drenched with spray so as to wet the entire leaf surface.

The naphthalene-silica dust proved of little use as a repellent, and treated plants were almost as severely attacked as plants on control plots. It was also observed that, when dusting was carried out soon after disbudding, unhealed surfaces became corky and the plants refused to "break." Extensive callouses occurred in places where the dust lodged, as along the mid-

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ribs of leaves, and in the leaf axils—where the bud is sometimes destroyed.

Sulphur dust had some repellent effect on the Chrysanthemum Leaf Miner, and plants treated with sulphur dust were less severely attacked than those receiving no treatment.

Nicotine dust proved valuable both as a repellent and killing agent, and a high degree of control followed its use.

The best results followed the use of nicotine spray, whether made from proprietary solutions containing nicotine (10 per cent.) or as home-made wash containing 1 oz. of nicotine (98 per cent.) in 20 gal. of water with a suitable spreader.

The results of these experiments are shown in Fig. 4, and the columns indicate the number of mines per shoot after treatment.

It should be noted that the practical difference between the home-made and the proprietary nicotine mixture is very small.

Recommendations. Control of the Chrysanthemum Leaf Miner can be obtained by routine spraying with nicotine, and the intervals between spraying should not be more than ten days. Nicotine dust and sulphur dust are valuable for checking the insect under extensive conditions where frequent spraying may not be convenient. The dusts should be applied

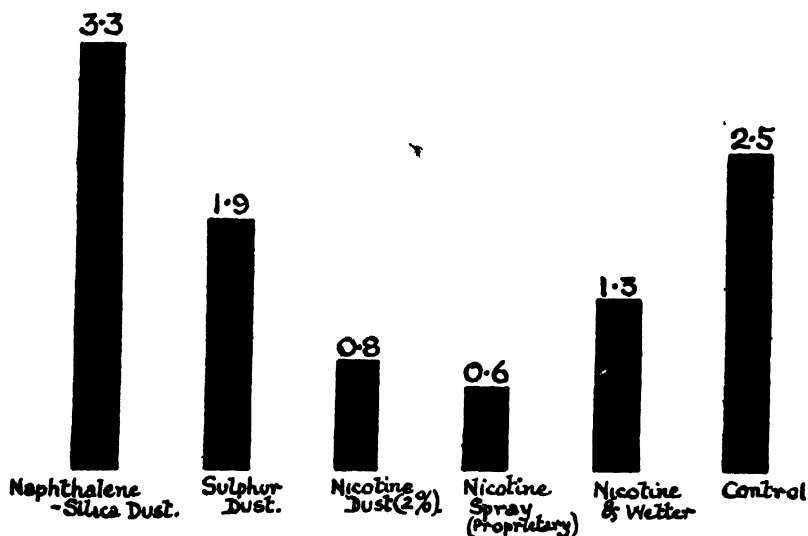


FIG. 4.—Mines per top 6 in. of growth (50 plants examined in each instance.

THE CHRYSANTHEMUM LEAF MINER

once every ten days and both surfaces of the leaves should be well covered.

Maximum freedom from infestation by Chrysanthemum Leaf Miner is likely to be obtained when the cuttings are dipped in dilute nicotine solution before they are boxed for striking and subsequently sprayed every ten days with nicotine spray. After the plants are taken out of doors routine spraying with nicotine wash or dusting with nicotine dust or sulphur will protect them from attack. In this way healthy plants having perfect foliage, and showing few indications of leaf miner, capsid or aphid attack, are obtained by the flowering season.

The writers are greatly indebted to Mr. N. J. Macpherson, of the Lancashire County Horticultural Staff, for his kindness in placing plants and apparatus at their disposal and for taking a keen personal interest in the progress of the experimental and biological work. Figs. 2 and 3 of the illustrations are reproduced from *Insect Pests of Glasshouse Crops*, by H. W. and Mary Miles.

THE STOOL BENT OR HEATH RUSH

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SOWERBY, in his *English Botany*,^{1*} has said that "though the rush has become a proverbial type of worthlessness, some of the plants we know are far from being as useless as popular sayings infer." It is probable that this writer had in mind the common rush (*Juncus communis*) and the numerous uses to which it is put in certain areas, but his dictum applies with no less force to that member of the genus commonly known as "stool bent."

The stool bent or heath rush (*Juncus squarrosus* Linn.) is found throughout Central and Northern Europe and in Asia, on heaths and pastures of the poorest class, and in situations too dry to be congenial to most species of *Juncus*. It is quite common in Britain, and, although largely confined to upland districts, has a distribution which extends from Cornwall to the Shetlands. The plant is a perennial with many narrow, grooved and rigid radical leaves, and forms dense tufts (Fig. 1 and 2). The flower stems are seldom more than 12 in. high, and have a compound panicle that is not much branched.

The harsh appearance of the stool bent is such as to discourage any belief in its value as a food for stock. Nevertheless, the experience of shepherds everywhere goes to establish its usefulness, and the most casual inspection of moorland swards is sufficient to show that the plant is much eaten by sheep under suitable conditions, i.e., on black-topped land that is only moderately moist. Wallace² states that, on really wet land, *Juncus squarrosus* does not attain any considerable size, and is little relished.

Like heather, the stool bent is evergreen, and on this account its greatest value is for winter sheep feed. According to Stapledon and Hanley³ it is probably the most useful winter grazing plant that contributes to the herbage of both Fescue-Agrostis and Nardus pastures. In hard, dry weather, or when there is nothing more than a light covering of snow

* For references, see page 265.



FIG. 2.—Tuft of Stool Bent or Heath Rush (*Juncus squarrosus* L.)

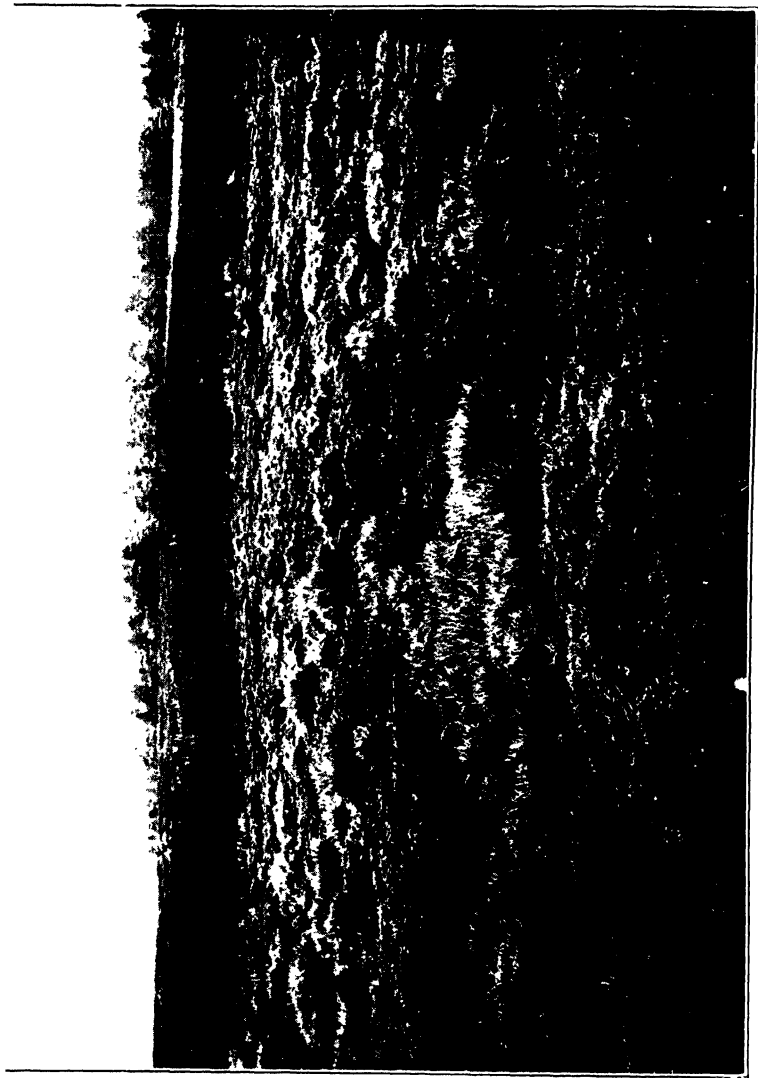


FIG. 2.—Stool Bent on recently-burned heather moor at Blanchard, Northumberland.
Photo: Brynmor Thomas.

THE STOOL BENT OR HEATH RUSH

on the ground, sheep seek it eagerly. In deep snow, however, its habit of growth is such that it cannot easily be reached. Like other plants upon which hill sheep feed during the months of scarcity, stool bent is somewhat neglected in the full flush of summer grass. It is probable that the summer value of the plant is greater on heather moor than on "white land," particularly after recent burning. During the two or three years that must elapse before heather again produces a reasonable amount of feed, certain supplementary plants, e.g., flying bent, draw-moss, stool bent, deer hair and species of *Carex*, enjoy a brief period of exceptional usefulness. Few moors produce all of these supplements, and, in many instances, it is the stool bent that yields the largest bite on newly-burned land. It should be added that the plant makes an appreciable contribution to the diet of the moorland game birds, the flower and seed heads being readily eaten. The utility of stool bent in this direction is therefore chiefly confined to summer and autumn.

Apart from a single incomplete analysis made by Kinch⁴ many years ago, no information as to composition appears to be available. In order to obtain further data and, in particular, to study the trend of seasonal variation, the writer recently undertook the examination of a series of samples.

Material for the purpose of this little investigation was obtained by the courtesy of Mr. J. Stephenson, J.P., of Newbiggen, Blanchland, from well-managed heather moor at an elevation of over 1,100 ft. The outstanding characteristics of the land, which may be described as "dry moor," have been detailed elsewhere.⁵ Samples were taken at intervals of four or five weeks, throughout the summer and autumn of 1935, from a strip of heather land that had been burned in the previous spring, and was already well colonized by *Juncus*. The sampling technique comprised hand-picking at random within a selected area of about one-tenth of an acre. The rush was in flower at the sampling on July 10, and the heads, having been separated from one-half of the material, constituted an additional analytical sample.

As it was considered unlikely that the determination of moisture content would yield useful information, the samples were not weighed, and were conveyed to the laboratory in ordinary seed bags. On arrival they were air-dried and ground in a power mill through the $\frac{3}{32}$ in. screen. The digestibility of the crude protein was determined by the

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method of Wedemeyer, and the true protein by the Stutzer process. For the determination of other constituents, the usual analytical methods were employed. To permit of the reduction of all results to a dry-matter basis, residual moisture was ascertained by weighing duplicate two-gramme samples simultaneously with the portions required for other determinations, and drying for an arbitrary period of twenty-four hours at 100° C.

The analytical results obtained are recorded below:—

TABLE I.—PER CENT. OF DRY MATTER

<i>Sampling date..</i>	<i>June</i>	<i>July</i>	<i>Aug.</i>	<i>Oct.</i>	<i>Dec.</i>	<i>July 10 (Flower heads).</i>
	<i>1</i>	<i>10</i>	<i>22</i>	<i>26</i>	<i>15</i>	
*Crude protein ..	14·03	9·03	8·44	7·82	7·77	8·53
Ether extract ..	1·58	1·46	1·40	1·39	1·31	2·12
Fibre	23·92	28·29	29·78	30·53	31·76	24·04
†Ash	3·65	3·55	2·93	3·44	2·41	3·77
N-free extractives ..	56·82	57·67	57·45	56·82	56·75	61·54
*Including..						
True protein ..	12·94	7·95	7·15	7·25	7·24	7·12
†Including..						
Phosphoric acid (P ₂ O ₅)	0·495	0·340	0·310	0·287	0·248	0·506
Lime (CaO) ..	0·177	0·142	0·142	0·143	0·116	0·142
Percentage digestibility of crude protein						
(Wedemeyer)	48·03	46·51	41·82	38·23	33·72	67·52

The above figures show that the crude protein content of stool bent in early summer compares favourably with that of many recognized fodder plants grown under better conditions. During late summer and autumn, however, there is a consistent decline, and a minimum protein content appears to be reached in winter. The digestibility coefficients of this constituent, which are no smaller than might be anticipated in grass from a rather poorly-managed pasture, also fall with great consistency as the season advances. As with most moorland plants, the true-crude protein ratio is high, being not less than 0·8 in any of the samples examined. The amount of fibre present bears a close inverse relationship to the crude protein and, except in the June sample, is rather high. The ether-soluble fraction of the dry matter is so small that it can hardly contribute much to the nutritive value of the plant, but it is interesting, in this connexion, to record the observations of Kinch,⁴ who states that, whilst the ether extract of grasses, sedges and many other plants contains much non-fatty material, the rushes yield an extract that contains little but true fat.

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In view of the widely held opinion that mineral deficiency may be responsible, in some measure, for the incidence of certain diseases that commonly affect hill sheep, but are as yet imperfectly understood, the mineral constituents of plants that are consumed to any considerable extent seem to be worthy of study. It is evident that stool bent, in common with many other non-ericaceous components of the moorland sward, contains little lime; during spring and early summer it probably contributes a fair share of phosphoric acid to the ration. That it cannot serve as a supplementary source of either of these important minerals is almost certain. It will be noted that the ash, phosphoric acid and lime show much the same seasonal trend as the nitrogenous constituents.

The flower heads, which, as already indicated, are of some value to grouse, prove to contain protein of high digestibility, and are a very useful source of phosphoric acid.

It may, therefore, be concluded that while stool bent does not take a particularly high place among the indigenous moorland plants that provide keep for the hill sheep and the grouse, it should at least be numbered with those *Junci* upon which Sowerby has bestowed his qualified commendations. Unlike draw-moss, the sedge that often grows near it, stool bent does not appear to be outstanding in respect of any particular food constituent, and cannot, therefore, serve to supplement any deficiency in another component of the moorland sward. As a quantitative supplement at opportune times, and under certain clearly-defined circumstances, e.g., on white land pasture in winter, and on heather moor after burning, stool bent is of considerable value to the hill farmer.

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"BUSHY STUNT": A VIRUS DISEASE OF THE TOMATO

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IN June, 1935, K. M. Smith announced the discovery of a new virus disease of tomato in this country^{1*} and since then the same writer has published a technical description of the virus² and an additional note on the disease.³ Plants affected by the same disease, were examined at the Cheshunt Experimental Station during March, 1935, and, later in the year, several other cases were recorded. Three of them were on commercial tomato nurseries in different parts of the west of England and a fourth was in Northern Ireland, so that the disease already exists in Britain in widely separated localities. The amount of damage done so far does not appear to have been very great, but, as the effect of the disease on tomato plants is very severe, an outbreak on an epidemic scale would be even more serious than a similar outbreak of Streak, the virus disease that still remains responsible for the greatest losses to tomato growers each year. In the present article, the rather unusual symptoms of the disease on tomato plants are described and control measures suggested.

Name of Disease. It is proposed to call this disease of tomato, "Bushy Stunt."

Symptoms. The effect of the virus on tomato seedlings is rather different from that on larger plants; and, although the reactions of seedlings to the virus are characteristic and valuable for diagnosis, it is with the effect on older plants that a grower is more concerned, hence this aspect of the disease will be described first.

The symptoms in a crop plant are a severe stunting, accompanied, in the early stages of the disease, by a yellow spotting of the upper leaves and, in the later ones, by malformation of the leaves and a bushy type of top growth, due to the shortness of the internodes and the precocious development of the side shoots. Fig. 1 shows a young crop plant that became naturally infected soon after being set out in the border. The lowest leaves (which have been removed) showed no abnormalities, but those in the middle region of

* For references, see p. 269.



FIG. 1.—A young crop plant naturally affected with Bushy Stunt soon after being set out in the border.

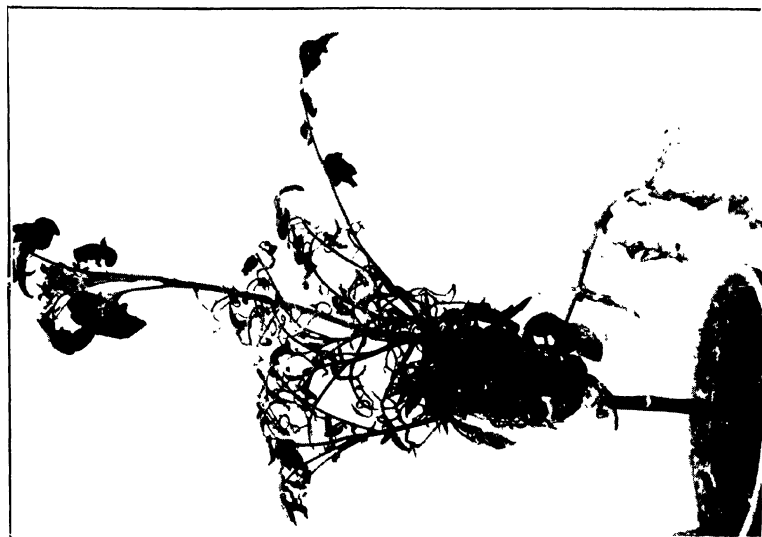


FIG. 2.—The same plant six weeks later.
Photos G. C. Anoncorrh.



Photo. G. C. Ainsworth.

FIG. 3. A tomato plant seven weeks after being experimentally infected with "Bushy Stunt."

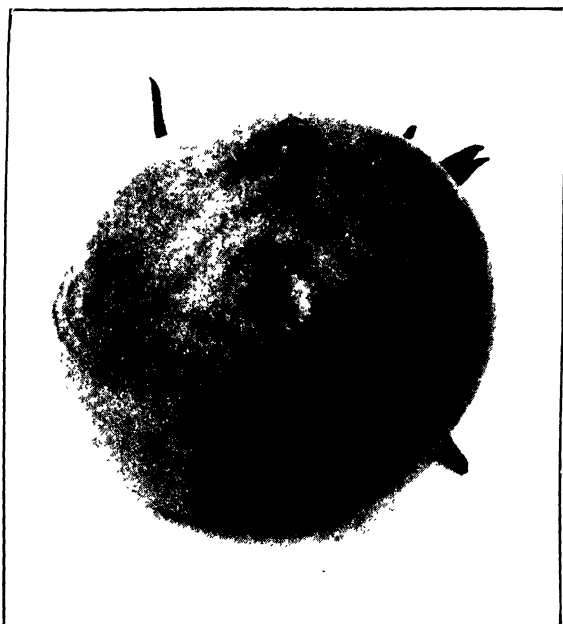
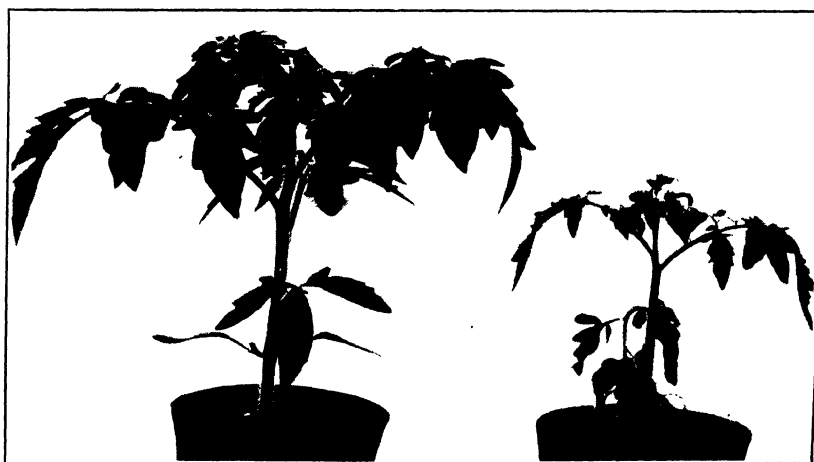


FIG. 1. Tomato fruit, showing developments of yellow ring and line patterns, resembling a "water mark" on bank note paper.

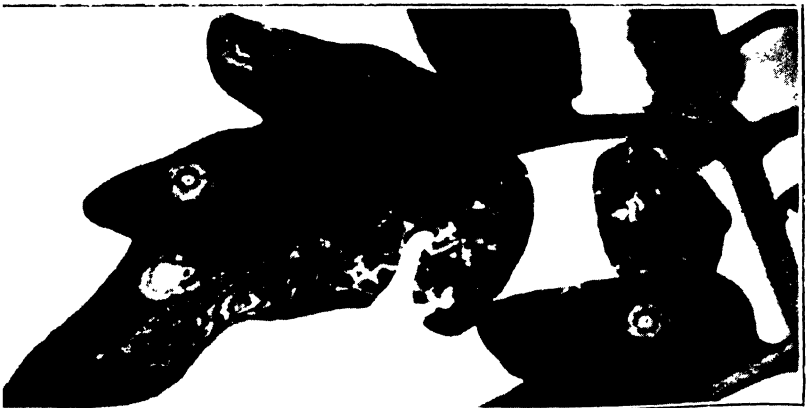


Photos: G. C. Amisworth.

FIG. 6. Seedlings. Showing (on right hand plant) rapid effect of inoculation, the lower leaves turning yellow or purplish in less than a week, and the plant dying



FIG. 5. Yellowish spots developed on the young leaves of a seedling less than a week after inoculation growth stops.



Photos: G. C. Ainsworth.

FIG. 7.— Yellow spots taking the form of a series of concentric rings.

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the plant were yellowish, spotted and wilting. The top leaves had their leaflets rather distorted and the leaves themselves were curled. Fig. 2 shows the same plant, six weeks later. It can be seen that it made very little growth in height during that interval (although this was during the good growing months of May and June) and that the leaves produced on the side shoots exhibited extreme distortion. The blades of the leaflets were either almost completely suppressed or malformed. Leaves of the top growth, though not so severely distorted, showed a mild mottle, similar to that of ordinary tomato Mosaic, but with an occasional yellow spot or ring-like mark. Fig. 3 shows another tomato plant, seven weeks after being experimentally infected with the virus. This plant was about 9 in. high when inoculated, and barely 2 ft. 6 in. tall when photographed. It shows the same type of symptoms as those exhibited by the plant in Figs. 1 and 2, with the leaflets narrowed and twisted, those in the apical region mildly mottled, and the plant bushy in appearance.

Few fruits were produced on infected plants, but the majority of those formed, were normal in appearance, though rather small in size and of poor shape. Some fruits appeared normal while still green, but on ripening they developed on the surface a series of yellow ring and line patterns, resembling the " water mark " seen in bank note and similar paper. An occasional fruit (Fig. 4) whilst unripe, showed similar patterns in brown. Such markings recall Buck Eye Rot (caused by the fungus *Phytophthora parasitica*), but the areas between the brown lines are of normal green colour and the fruit remains firm. (In Buck Eye Rot, the whole of the affected area is brownish and the fruit tends to soften.)

Seedlings, unlike larger plants, are frequently, but not invariably, killed outright by the disease. Less than a week after inoculation growth stops, yellowish spots develop on the young leaves (as shown in Fig. 5), the lower leaves turn yellow or purplish and droop (right-hand plant in Fig. 6) and the plant dies. At times, brownish-coloured streaks (similar to the lesions that characterize Streak disease) develop towards the top of the stem and on the base of the leaf stalks, and these hasten the death of the plant. At other times, especially in late autumn when conditions are unfavourable for growth, and seedling plants raised at that season tend to become " soft," death is preceded by a " drying out " of the leaves, giving them a scorched appearance. In young

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plants, too, lesions may develop at the collar region and the plants then fall over. Such lesions at soil level are usually, if not invariably, caused by one or other of the fungi responsible for the well known Damping Off disease of tomatoes. A plant affected with Bushy Stunt does not grow away; its roots begin to die, and if the soil becomes water-logged, conditions are very favourable for invasion by fungi present in the soil. In other words, infection of young tomato plants by this virus reduces their power of resisting attack by soil fungi.

Seedling plants that are not killed remain stunted and develop twisted misshapen leaves. Sometimes the growing point of the main stem is killed, and then subsequent growth is made by the side shoots. The severity of the stunting can be seen in Fig. 6, both plants having been of the same age when photographed. The right-hand one was the same size as that on the left (healthy control) when inoculated with the virus thirteen days previously, and it had been showing symptoms for six days.

The yellow spots produced on the leaves of both seedlings and larger plants frequently take the form of a series of concentric rings, as shown in Fig. 7. This is another symptom useful for recognizing the disease. As a rule the yellow spots are scattered, and there is not the general yellow mottling that is characteristic of Yellow Mosaic.

Control. The virus of Bushy Stunt can be transferred from plant to plant by juice inoculation, that is to say, the disease could be spread by the pruning knife, although it has been found experimentally that seedling plants are much more easily infected by this method than larger plants; in the latter the virus often appears to remain localized in the leaflets inoculated. Under natural conditions, some insect is probably responsible for spreading the disease, but at present no insect carrier is known. Unlike the virus of ordinary tomato Mosaic, the virus of Bushy Stunt cannot survive for long periods in dead plant material, hence it could not occur in smoking tobacco. The roguing out of diseased plants and care in pruning are the only control measures that can be recommended.

Bushy Stunt is another addition to the list of virus diseases that affect the tomato. The effect of it on tomato plants is severe and, as previously mentioned, it already appears to exist in localities scattered through the country. Nevertheless,

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it is thought that tomato growers need not feel unduly alarmed. As the already recognized virus diseases of the tomato continue to be critically and carefully investigated, it is to be expected that further diseases of this type will be discovered; but even a virus able to cause considerable damage and loss under experimental conditions, or in some other part of the world, may prove less serious under the conditions prevailing in this country. Spotted Wilt of tomato, for example, is a devastating disease in Australia among field-grown tomatoes, but in Great Britain it cannot be considered as one of first importance on large tomato nurseries. Only in mixed nurseries, where miscellaneous plants, all susceptible to attack by the Spotted Wilt virus, are grown in proximity to tomatoes does control become difficult. On the other hand, it is very important for growers to become familiar with the different diseases, especially those that are potentially serious but have not yet occurred in epidemic form. With such knowledge and with full co-operation, growers are in a position to prevent serious developments by eradicating disease at the earliest possible moment.

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- ³ *Jour. R.H.S.*, lx, 448-51 : 1935.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions are given below for April, 1936, with comparable figures for the previous month and for the corresponding month last year. The wholesale liquid milk price prescribed by the Board for April, 1936, was 1s. 4d. per gal. In March, 1936, the wholesale liquid price was 1s. 5d. per gal. and in April, 1935, 1s. 4d. per gal.

Region	Pool Prices			Producer-Retailers' Contributions		
	April	Mar.	April	April	Mar.	April
	1936	1936	1935	1936	1936	1935
	d.	d.	d.	d.	d.	d.
Northern	11½	12½	12½	4	3½	3½
North-Western ..	11½	12½	12	4	3½	3½
Eastern	11½	13½	12½	3½	3½	3½
East Midland ..	11½	13	12	4	3½	3½
West Midland ..	11½	12½	11½	4½	3½	3½
North Wales ..	11½	12½	11½	4½	3½	3½
South Wales ..	11½	12½	12½	4	3½	3½
Southern	11½	13½	12½	3½	3½	3½
Mid-Western ..	11½	12½	11½	4½	3½	3½
Far-Western ..	11½	12½	12	4½	3½	3½
South-Eastern ..	12½	13½	12½	3½	3½	3½
Unweighted Average	11·52	12·89	12·09	3·98	3·65	3·56

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal. For the latter, 15,762 producers qualified during the month, and the sum required for the payment of the premium to them was equivalent to a levy of 336d. per gal.

The inter-regional compensation levy was fixed at 2½d. per gal. on liquid milk sales, compared with 2½d. per gal. in April, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	April, 1936 (estimated)	April, 1935
	Gallons	Gallons
Liquid	45,435,419	45,772,888
Manufacturing	31,593,504	30,092,511
	<hr/> 77,028,923	<hr/> 75,865,399
Percentage liquid sales :	59	60·3
Percentage manufacturing sales :	41	39·7

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The average realization price of manufacturing milk during April was 4·885*d.* per gal. compared with 5·20*d.* per gal. for April, 1935. The quantity of milk manufactured into cheese on farms was 1,342,723 gal. compared with 629,414 gal. in March and 1,541,576 gal. in April, 1935.

Hops Marketing Scheme. The estimated demand for hops of the 1936 crop exclusive of hops delivered under contracts registered by the Board has been fixed at 225,000 cwt., the same as for 1935. Accordingly, producers' annual quotas of the 1936 crop will again be 100 per cent. of their basic quotas.

At the fourth annual general meeting of registered producers, held on May 8, the Chairman reported that total consignments to the Board of the 1935 crop amounted to 232,389 cwt., of which 224,217 cwt. (96·5 per cent.) were Quota Hops and 8,172 cwt. (3·5 per cent.) Non-Quota Hops. Total sales realized £2,002,843, exclusive of the Levy Fund payment of 10*s.* 0*d.* per cwt. The Board has therefore made to producers, distributions that, up to the present, equal 99 per cent. of the valuations of quota hops.

The four special members of the Board were re-elected for a further year.

Pigs and Bacon Marketing Schemes. *Pig Prices for May, 1936.* Contract prices for bacon pigs showed a slight decline in May, the price of the basic pig (Class I, Grade C) being 11*s.* 4*d.* per score compared with 11*s.* 7*d.* for April. There was no appreciable change in the cost of the feeding stuffs ration; the slight decline in pig prices was due to a fall in the ascertained bacon price from 92*s.* 8*d.* to 89*s.* 8*d.* per cwt. and also to a drop in the realization value of offals from 10*s.* 1*d.* to 9*s.* 10*d.* per pig.

Pigs Marketing Board: Co-opted Members. After consultation with the Pigs Marketing Board, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland acting jointly have made an Order* amending the Pigs Marketing Scheme so as to provide for the co-option by the elected members of the Board, after consultation with the Market Supply Committee, of two additional members.

Regulation of Imports of Meat, January-March, 1936. The arrangements made for the regulation of imports of beef

* The Pigs Marketing Board (Co-opted Members) Order, 1936.

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and veal in the first half of 1936 were described in the March issue of this JOURNAL (pp. 1263-4) and for imports of mutton and lamb from Australia and New Zealand in the year 1936 in the issue of September, 1935 (p. 584). Arrangements have since been made for regulating imports of frozen pork from Empire sources in the first half of 1936. Imports of mutton and lamb and frozen pork from foreign countries in the first two quarters of 1936 are being regulated on the same quantitative basis as in 1935, namely, for frozen mutton and lamb 65 per cent. of the quantities imported in the corresponding quarters of the Ottawa Year, and for frozen pork the average of imports in the corresponding quarters of the three years 1932, 1933 and 1934.

The following statement shows imports from Empire countries in January-March, 1936, compared with the agreed maxima for the year for mutton and lamb, and for the first half of the year for beef and veal and frozen pork; and imports from foreign countries in January-March, 1936, compared with the allocations for the first quarter in the case of mutton and lamb and frozen pork, and for the first half of the year in the case of beef and veal.

	<i>Empire Countries</i> ooo cwt.		<i>Foreign Countries</i> ooo cwt.	
	<i>Agreed maximum, Jan.-June</i>	<i>Imports, Jan.-Mar.</i>	<i>Allocation, Jan.-June</i>	<i>Imports, Jan.-Mar.</i>
Chilled and Frozen Beef and Veal ..	1140.9	368.8	4562.1	2282.3
Frozen Mutton and Lamb ..	<i>Agreed maximum, Jan.-Dec.</i>	<i>Imports, Jan.-Mar.</i>	<i>Allocation, Jan.-Mar.</i>	<i>Imports, Jan.-Mar.</i>
	5650.0	1223.4	347.7	345.2
Frozen Pork..	<i>Agreed maximum, Jan.-June</i> 491.4*	<i>Imports, Jan.-Mar.</i> 231.3	<i>Allocation, Jan.-Mar.</i> 65.7	<i>Imports, Jan.-Mar.</i> 27.7

* Includes one-half of the allocations for baconer carcasses to Australia and New Zealand for the year 1936.

Supplies of all classes of meat from Empire sources were thus well within a proportionate share of the agreed maxima. Imports of mutton and lamb from foreign sources corresponded closely with the allocation, and imports of beef and veal were almost exactly half of the allocation for the six

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months, January-June. Owing to the continuance of short supplies from the United States of America, imports of foreign frozen pork amounted to only 42 per cent. of the allocation for the quarter.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted, by May 15, to £6,406,404. These payments were in respect of 2,693,306 animals, the average payment per beast being £2 7s. 7d. Some 811,062 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the marking of Imported Cattle Orders, 1934 and 1935.

Regulation of Imports of Processed Milks. The arrangements for the regulation of imports of processed milks from foreign countries and the Irish Free State described in the June, 1935, issue of this JOURNAL (pp. 272-3) have been subsequently continued quarter by quarter.

Imports of processed milks in the first quarter of 1936, together with the allocations made to foreign exporting countries and the Irish Free State, and imports from other Empire countries in the corresponding quarter of the two previous years, are shown in the following table:—

Source	Condensed Skimmed Milk	Condensed Whole Milk	Milk Powder	Cream
	cwt.	cwt.	cwt.	cwt.
Foreign Countries—				
Allocations	291,000	46,000	10,000	8,000
Imports.. ..	277,000	38,000	4,000	6,000
Irish Free State—				
Allocations	12,000	4,000	*	4,000
Imports.. ..	12,000	3,000	—	7,000
Other Empire Countries—				
Imports :				
Jan.—Mar. 1934	—	6,000	54,000	—
„ 1935	—	21,000	58,000	—
„ 1936	—	18,000	58,000	—

* Imports of milk powder from the Irish Free State are not at present subject to regulation.

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Milk Acts, 1934 and 1936: *Manufacturing Milk.* Advances made by the Ministry up to May 15, 1936, in respect of manufacturing milk, were as follows:—

Section		Period of Manufacture	Gallons	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to February, 1936	340,374,354	1,862,116
2	Manufactured by the Board	April, 1934, to September, 1935	2,573,662	12,850
3	Made into cheese on farms	April, 1934, to December, 1935	29,776,000	161,399
	Total for England and Wales		372,724,016	2,036,365
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries	April, 1934, to February, 1936	41,165,151	291,900

Milk-in-Schools Scheme. Exchequer contributions up to May 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 32,395,772 gal. of milk to schoolchildren at reduced rates during the months October, 1934, to February, 1936, amounted to £620,753. The following statement compares the gallonage consumed in the first five months of the first and second years of the scheme:—

			1st Year	2nd Year
			Gallons	Gallons
October	..	..	1,971,532	2,270,060
November	..	..	2,447,947	1,946,302
December	..	..	1,771,210	1,557,314
January	..	..	2,173,306	1,867,687*
February	..	..	2,346,656	1,916,310*
Totals for five months			10,710,651	9,557,673

* The figures for these months will be increased when further returns are received.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer

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to Milk Marketing Boards, or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and by the Secretary of State for Scotland, to be 4·43 pence per lb. for the month of May, 1936.

Beet Sugar: *Results of the 1935-36 Campaign in Great Britain.* A comparative statement of the beet-sugar manufacturing campaigns 1934-35 and 1935-36 is given below:—

	1935-36	1934-35
Acreage under Sugar Beet	374,753	403,884
Tonnage of beet delivered to factories ..	3,403,989	4,094,707
Average yield of beet per acre (tons) ..	9·1	10·1
Average sugar content of beets (per cent.) ..	16·4	17·1
Average farm output of sucrose per acre of beet (lb.)	3,337	3,888
Average price paid per ton of beet delivered to factories	38s. 10d.	40s. 9d.
Total sum, including cost of transport, paid by factories to growers	£6,609,000	£8,343,000
Number of beet growers	44,819	46,054
Average acreage per grower	8·4	8·8
Number of factories	18	18
Average number of days worked at factories	98	122
Average number of workers employed in factories	9,500	9,600
Production of sugar (tons)	487,325	614,798
Average extraction of sugar expressed as a percentage of beets delivered to factories	14·3	15·0
Average extraction of sugar expressed as a percentage of the total sucrose in the beets	87	88
Average factory output of manufactured sugar per acre of beet grown (lb.)	2,913	3,410
Production of by-products:		
Molasses (tons)	*123,800	147,225
Pulp: Dry (tons)	276,739	313,462
Wet (tons)	116,324	143,327
Subsidy paid:		
Sugar	†£2,218,512	£3,993,220
Molasses	—	£436,345
Total	†£2,218,512	£4,429,565

* Estimated (Molasses was not entitled to subsidy in 1935-36)

† Due to be augmented by a further sum not exceeding £555,000 for capital services under the terms of the Sugar Industry (Reorganization) Act, 1936.

The Sugar Industry (Re-organization) Bill. This Bill received the Royal Assent on May 21, 1936.

Wheat Act, 1932: *Sales of Home-Grown Wheat—Cereal Year, 1935-36.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to May 1, 1936, cover sales of 28,851,559 cwt. of millable

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wheat, as compared with 30,334,074 cwt. in the corresponding period (to May 3, 1935) in the last cereal year.

Deficiency Payments. The Wheat Commission made a third advance payment to 29,662 registered growers on April 25, at the rate of 2s. 9d. per cwt. (12s. 4½d. per quarter) in respect of 6,868,409 cwt. (1,526,313 quarters) of wheat vouched for by 42,906 wheat certificates delivered to the Commission between January 24 and April 3. The total amount involved was approximately £944,400. Any balance due on these certificates will be paid in September, 1936.

National Mark Canned Fruit and Vegetables. At a recent meeting of the National Mark Canned Fruit and Vegetable Trade Committee, the operation of the scheme during 1935 was reviewed.

At the beginning of the 1934 season authorized canners were recommended to adopt certain suggested standard weights and sizes for canned vegetables packed under the National Mark. During the canning seasons of 1934 and 1935 no substantial objections were received in regard to the recommended standard weights, but it was found that, while the packing of peas to the sizes recommended for small, medium and large grades was practicable, the lack of suitable machinery for the size-grading of other vegetables rendered it difficult to adhere strictly to the suggested size standards for these vegetables. On the recommendation of the Trade Committee, and with the concurrence of the Canners' Association of Great Britain, it is, therefore, proposed to include in the statutory requirements of the scheme for 1936 the standard weights hitherto recommended for all vegetables, but the standard sizes for peas only.

National Mark Dressed Poultry. The total output of National Mark dressed poultry from authorized packing stations during 1935 was 1,608,231 birds, representing an increase of over 35 per cent. on the previous year's output of 1,189,447 birds. Of the 1935 output, 351,775 birds were graded "Select" and packed under National Mark labels, representing an increase of approximately 70 per cent. over the previous year's output of 212,400 birds graded "Select." It is noteworthy that these increases have been achieved in spite of the fact that the number of authorized packing stations decreased from 48 in 1934 to 40 in 1935.

During last year, the general standard of grading and pack-

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ing showed a steady improvement, and a fair volume of supplies under the National Mark is now being handled in provincial centres as well as in London.

The majority of packers now incorporate the National Mark in their own private brands, under licence from the Minister. Although the output of dressed poultry under the National Mark represents but a small proportion of the total volume of home-produced supplies, market inspections and general observations indicate that this scheme has had a greater influence on the technique of poultry marketing than the figures of output of poultry packed under National Mark labels would suggest. The methods of packing and marketing which the scheme was designed to encourage, have been widely adopted as a standard by progressive producers and packers throughout the country.

There has also been an increasing realization, on the part of producers, of the prime necessity of raising table birds of the right type, and the movement has been further stimulated by the greater attention given by the Press and educational authorities in general to this aspect of poultry marketing.

Northern Ireland : New Egg Marketing Bill. The sale of hen and duck eggs is at present regulated by the Marketing of Eggs Act (Northern Ireland) 1924, as amended by the 1926, 1928 and 1931 Acts. Under this legislation wholesale dealers in eggs are licensed in two classes: *Class A*, which comprises dealers who buy eggs and test and pack them either for the home wholesale trade or for export; and *Class B*, which consists of smaller dealers (comparable with "higgler") who buy from producers and re-sell only to holders of *Class A* licences. Wholesalers' premises and premises used for preserving must be registered. Rules under the Acts have been made from time to time prescribing, *inter alia*, standards for packing cases and methods of marking cases with grade designations. An official inspection service is maintained, and a fee of $\frac{1}{2}d.$ per 30 doz. eggs is payable in respect of graded consignments sent to Great Britain, the Irish Free State and the Isle of Man.

The present Bill proposes the establishment of an Egg Marketing Committee consisting of a Chairman and two other members appointed by the Minister of Agriculture, five members appointed by the Minister to represent egg producers, and seven members elected by licensed wholesale dealers. Under the new Bill the Ministry of Agriculture takes powers

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to determine, after consultation with the Egg Marketing Committee, the prices at which and the terms on which eggs may be purchased by licensed dealers. It is also provided that the Ministry may refuse a new wholesaler's licence if, after consultation with the Egg Marketing Committee, it is satisfied that there are already sufficient licensed wholesale dealers in the area concerned. Retailers, other than producer-retailers, are to be licensed, and in addition to the annual licence fee they are to pay a levy of $\frac{1}{4}d.$ per doz. egg sold. Fresh eggs sold retail are to be sold either as "new laid" or as "second" eggs, according to standards of quality to be prescribed. The conditions under which eggs may be stored or exposed for sale by retail are also to be subject to control. An Egg Marketing Fund, to be administered and controlled by the Ministry, is to be credited with all sums received under the Egg Marketing Acts, and will be used to meet the expenses of administration and for purposes of research, education and publicity.

Netherlands : The New Bacon Regulations.—Under the bacon control regulations in force before March 30, 1936, the Pigs Central completely controlled bacon production (all of which was for export) by distributing supplies of bacon pigs to the factories, which were required to manufacture as and when directed. The factories were guaranteed a price sufficient to allow for a reasonable margin of profit and risk.

According to an article in *De Telegraaf*, the new bacon regulations which came into force on March 30, replaced this system by one permitting the bacon factories to make a collective tender for exports and to extend their output for the home market. It is asserted that the capacity of the Netherlands bacon factories is still too great for requirements. They could deal with 40,000 pigs a week, but the weekly average of killings required for export is only 9,000 to 9,300, and three or four of the largest factories (there are twenty-two altogether) would easily manage this quantity. Under a system of free tender, these few concerns would combine to undertake the whole of the slaughtering and the other concerns would have to close down. The number of factories should, of course, be reduced, but by a process of reorganization that provided for the continued activity in other directions of factories not required for bacon curing. The way should be open for them to change over to the wholesale trade or to the manufacture of meat products. In view of these facts, the Government have preferred to give the bacon factories the opportunity of making a common tender in the hope that, in this way, the producing capacity may be adapted smoothly to export possibilities.

The decontrol of bacon slaughtering, combined with an export levy, which has been recommended from many quarters, is thought to be impossible because it would involve a heavy fall in the price of pigs to the advantage of the meat product manufacturers, but not of the pig-keepers for whose benefit the regulatory system has been instituted.

The new regulations are to remain in force provisionally until June 30. Either side may give a month's notice to terminate them. (*Note by the Market Supply Committee.*)

JUNE ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

OVER most of the country, June is one of the busiest months of the year on the farm, hay-making and hoeing causing high demand on labour. In the north and west, while hoeing is actively carried out this month, much of the haymaking falls in July. The later hay harvest, and the smaller proportion of arable land help to account for the fact that the amount of casual labour engaged this month is small in Wales and the west of England compared with that in the S.E. counties. Most of the casual labour in the former areas is demanded later for potato lifting in districts where much of this crop is grown, whereas in the latter portions of the country the hoeing of roots and beet causes a demand in June.

Early Potatoes. The marketing of early potatoes in June is restricted to a few areas; the coastal districts of Cornwall and the Girvan district of Ayrshire are important. The latter is not only early, but the soil is such that, on many farms, moderately wet weather does not stop work. There, the growing crop is sold by auction; the buyer supplies the manual labour for lifting and marketing, while the seller provides the horses. An interesting example of the value of the crop can be seen along the coastal road in the Girvan area, where the fields are bounded by stone walls, or earth banks; the gates are made wind-proof by sacking, without which patches of the crop around the gateways would be damaged.

The best date for the harvesting of early potatoes is not always easy to decide. The yield increases daily, but the price decreases. As an example of the increase of crop that is obtained by delaying harvesting, a trial with Arran Pilot, carried out at the College Farm, Aber, may be quoted. The crop was planted on March 24, 1933; the comparative yields obtained by lifting on June 9, 21 and 30 were respectively 3 tons, 4·7 tons, and 7·9 tons. In that year, the crop raised on the middle date paid best.

Weeding. Much hoeing is done this month, although in most places cereal hoeing will be finished. Near Bedford, for example, wheat is hoed by hand, though before this

JUNE ON THE FARM

month. In that district, wheat is mostly taken to break the sequence of market-garden crops, and thus lessen the danger from insect and fungus pests. It would be a mistake to allow the land to get foul under the cereal crop, after the thorough cleaning given when under the market-garden crops; besides, it is argued, an extra 6s. per acre is not much on a good crop of wheat.

The spudding of thistles in corn is not as common as it used to be. This does not destroy the thistles, but limits their development. When the corn used to be tied by hand, those whose hands were not hardened were specially thankful for this operation!

A variety of horse and power hoes is available for root and beet crops. A manufacturer stated recently that the hoe, like the bicycle, had reached the limit of improvement some time ago, and that although models might differ in regard to the number of rows that they would take, or in the shape of the tools, there were no essential differences. He admitted, however, that the disc was a recent advance which enabled the soil to be cut away quite close to the crop without throwing soil on the young plants sown on the flat. The one-row horse hoe is the most popular in the west and north; a 3-rowed hoe for use after a 3-rowed ridger and drill is popular in the Eastern Counties. An interesting model examined recently was made to allow for any "kinks" in the rows. In this model the handles were fastened to the bar to which the horse was attached, and to the rear bar of the tool frame; thus, the effect of moving the handles is to push the implement to one side or the other as desired.

Tractors can be used for hoeing if the wheels are narrow and can be adjusted for width. During a visit to the Fordson Estates, in Essex, last year, it was observed that ponies were used with a single-row hoe. An acquaintance stated recently that he had seen an old car used very effectively for drawing a hoe.

In grass land weeding, thistles come to mind first. Where they are cut only once a year, July or August is the most suitable month; with two cuttings, one is given in June. Rushes are increasing their hold on many areas of grass land. The common rush (*Juncus communis*) generally appears on land that is badly drained. In grass land laid in ridge and furrow, it appears first in the furrows, and later spreads to the ridge, or crown. Draining may

JUNE ON THE FARM

render the land unsuitable for this weed, but, once it has taken firm hold, draining must be followed by cutting. Indirect drainage effects, such as that accompanying penetration by the fibrous roots of clover, may also be effective in enabling land to resist invasion by rushes. Thus, at Cockle Park (this JOURNAL, October, 1930) a great difference in this respect was recorded between slagged and unslagged plots of grass land. On the land that had received no phosphate, the tops of the rigs were harsh and matted, water scarcely penetrating after heavy rain, but accumulating in the furrow, where vigorous growth of rushes took place. On the slagged land, where there was herbage of better quality and more wild white clover, the growth of rushes was retarded; this was claimed to be due to the better natural drainage, and also to the closer grazing. In the *New Zealand Journal of Agriculture* (January, 1936) it is contended that rushes may appear even if there is no defective drainage. An example is given of two portions of land, equally well drained, one rush-infested and the other free. The infested pasture had been badly managed from a grazing point of view, and it is claimed that rushes can be brought on by too hard grazing, lack of fertilizers, or poor seeds mixtures.

Rush growth can be prevented by leaving a field for hay occasionally, or by frequent cutting before allowing the rushes to form clumps. A good example of the efficacy of haying a field was seen lately in a fertile valley; the only rush-free field was a meadow that was mown for hay 2 years out of every 3.

Hay Harvest. As far as can be judged at the time of writing, fair crops of hay seem likely—except in areas where the clover and sainfoin have been badly damaged by stem-rot. The loss from this pest is heavier in the Eastern Counties this year than ever. The clover that looked best after last harvest is said to be the worst affected with this disease.

Short cuts to haymaking have been the subject of much discussion and experiment. It is an interesting fact that the chief efforts at improving and expediting the getting of hay are made by newcomers to the practice of farming. A farmer, born and bred, is used to disappointments caused by weather, whereas, to a newcomer in the profession, the experience of heavy rain just at the time when a crop is ready for carting is unforgettable, and he starts thinking and devising.

Adaptations of the "sweep" have been the means of

JUNE ON THE FARM

enabling many to harvest their hay quickly. No time is spent on cocking; no heed is taken of Tusser's advice, written nearly 400 years ago:—

“ Take heed to the weather, the wind and the sky,
if danger approacheth, then cock apace, cry.”

Well-made hay cocks do not let in much rain, and enable hay to be saved without much bleaching; it must be admitted, however, that it is not as labour-saving or as expeditious as the sweep method. Last year, several tried the system of baling hay direct from the wind-row; in parts of France this method is common. It has the disadvantage of requiring more than one baler; as regards quality, it should be satisfactory, but, unless care is exercised, mouldy hay may be obtained.

For those who wish to try something new, Proctor's Tripods may be commended. These enable large cocks to be made before the hay is bleached, when a good quality, greenish hay results. The cocks are built over patented steel tripods, leaving an opening in the centre, which is connected to the outer air by a bridge effect, thus encouraging drying without exposure.

For Young Farmers. Though more shearing is done in June than in any other month, it extends from early May, when a start may be made on the tegs of lowland flocks, to early August in some mountain flocks. The cause for such late shearing is the late ripening of the wool, and the importance of not shearing until the risk of cold nights is past. The risk from cold weather after clipping is a real one on mountains, and it is claimed by some that the reluctance of many upland flockmasters to give up the hand shears is due to the fact that the machine clips too close and leaves the sheep quite unprotected. To overcome this, some makers now provide for mountain flocks special shears that leave a little wool for protection.

The price of wool is unique amongst that of other farm commodities, as it is lowest in relation to pre-war values, and also in the great variation of price paid for wools of different quality at a given moment. The great difference in price between good and poor wool has focussed much attention on the desirability of wool improvement research, and on the work of the Wool Improvement Research Association at Leeds. Like other agricultural problems, that of wool

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improvement has not proved to be as simple as was expected by some. It is complicated by the fact that, to the producer, the fundamental value of wool is in the protection it provides to the sheep from cold and wet weather, while, to the manufacturer, it is simply raw material for making a particular kind of cloth. One of the valuable features of the work of the Association has been the endeavour to get manufacturers and producers to understand each other's problems.

The fleece consists of fibres of various kinds, dimensions and density, varying from best quality wool fibres to hair and kemp; some fibres may even be wool at one end and hair at the other. The Blackface, for instance, gives a hairy, low-quality fleece; the Welsh Mountain gives a fleece of low price because of the kemp in it—parts of the fleece with but little kemp may be of high value and used for best quality tweeds; Down breeds give fleeces of high quality, with no hair or kemp. Again, a fleece on a given sheep varies in composition during the life of the animal. Thus, Suffolk lambs are nearly black because of the quantity of black hairs, which are later shed and replaced by wool; even Merino lambs are very hairy when young.

As an instance of the type of problem encountered in research work on wool improvement, where the needs of both producers and manufacturers have to be kept in mind, the work of Professor R. G. White and Dr. Fraser Roberts at Bangor may be quoted. In any Welsh Mountain flock great variation exists. Some fleeces are full of kemp; others, grazing on the same pasture, are practically free from it. It would appear to be a fairly straightforward piece of work to select the kemp-free sheep and to build up from them a flock with wool that would appeal to the manufacturer. The farmer, however, has first of all to consider the sheep, and most mountain farmers are firmly convinced that, if they do away with kemp, they will lose the hardiness of the sheep. In the investigation referred to, it was, therefore, felt necessary first of all to discover whether there was real foundation for this belief. A start was made by marking lambs and following them through life. The first few hours of a lamb's life are perhaps the most critical of all its existence, and special attention was, therefore, paid to the type of covering of the newly-born lambs. It was found that they could be classified into three types—(1) lambs well protected with a strong, hairy coat, covering the whole body; (2) lambs almost destitute of

JUNE ON THE FARM

such a covering, but having just a very short, fine wool like that of a newly-born Southdown lamb; (3) lambs that had good protective covering over the middle and hind quarters, but only fine wool over the shoulders. Following these three types through life, the Southdown-resembling type of lamb invariably gave a fine fleece free from kemp; the majority of the well-protected lambs developed fleeces that contained a good deal of kemp. This at once reveals a reason for the belief indicated above. It is hardly conceivable that kemp adds anything to the protective qualities of the adult fleece, but, obviously, if a farmer selected his breeding stock simply for freedom from kemp, he would get a large proportion of sheep that had very little covering at birth, and, as subsequent work has shown, that would have a poor chance of survival if born under adverse conditions. The hairy coat that is desired is undoubtedly of the greatest possible value in a bad lambing season.

If this were the whole history, there would appear to be very little chance of meeting the manufacturers' requirements without sacrificing the farmers' interests. Fortunately, however, it was found that, while the majority of the well-covered lambs developed kempy adult fleeces, a small proportion shed the hairy coat at the age of a few months and their mature fleeces were as free from kemp as any manufacturer could wish. At present a flock bred on these lines is being built up.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended May 13.				
	Bristol	Hull	L'pool	London	Cost per Unit [¶]
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia :—					
Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium Cyanamide (N. 20.6%) ..	7 5e	7 5e	7 5e	7 5e	7 0
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	4 18	4 15	4 13	4 15	3 2
" " (Pot. 20%) ..	3 15	3 12	3 10	3 12	3 7
Muriate of Potash (Pot. 50%) ..	7 18	7 16	7 12	7 16	3 1
Sulphate " " (Pot. 48%) ..	9 8	9 6	9 2	9 6	3 10
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	—	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	—	2 19f	2 16g	3 6
" " (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½%, P.A. 20½%) ..	—	6 17	6 5h	6 0	—
Steamed Bone Flour (N. ½%, P.A. 27½—29½%) ..	5 12	5 10	5 2h	5 2	—

Abbreviations : N.=Nitrogen ; P.A.=Phosphoric Acid ;

S.P.A.=Soluble Phosphoric Acid ; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such fertiliser be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Protein Requirements. In discussing the subject of maintenance requirements in last month's Notes, a reminder was given that, along with the general requirement of the animal for energy for maintenance, there is a specific requirement for protein.

This need is obvious when we reflect that the dry substance of the cellular tissues of which the body structure and organs are composed consists almost entirely of protein. The incessant functional activity of the living cells in all parts of the body inevitably causes a certain amount of "wear and tear" of this structural material, which must be continuously made good if the structure is to be maintained. A supply of suitable nitrogenous matters from the food must therefore be available, and the only such material present in foodstuffs in more than very small proportions is protein.

This requirement for the upkeep in good repair of the cellular structure doubtless forms the major part of the protein-requirement for maintenance, but along with it there are other functional requirements dependent wholly or partly upon the protein supply, such as the production of the blood corpuscles, and of the various inner secretions and enzymes.

Similarly, if the animal is manufacturing products containing protein that are removed from the body, such as milk, eggs, wool and feathers, there must be supplied in the food an amount of digestible protein adequate to cover these losses.

Biological Value of Proteins. Just as the general energy-requirement of the animal for any particular purpose is subject to variation according to environmental and other circumstances, so also may the specific requirement for protein vary. Certain of the conditions that give rise to such variation will be discussed later, but one condition that affects all statements of protein requirements needs to be dealt with at the outset, namely the chemical make-up—or broadly speaking, the "quality"—of the protein supply available. Underlying every statement as to the quantity of protein required by an animal must be some implication as to the "quality" of the protein to be used.

NOTES ON FEEDING

The utilization of protein by the animal may be roughly compared to the erection of a building from materials obtained by pulling down another building (or buildings). Just as the building pulled down yields a variety of materials, so also the protein of food when "pulled down" by the digestive agents yields a variety of materials out of which it has been built up in the plant, these materials mainly belonging to the chemical groups known as amino-acids and amides. These amino-acids and amides pass through the walls of the intestines into the blood-stream and furnish the materials out of which the animal builds up the various proteins of its tissues, blood, milk, etc.

We may carry the analogy a stage further. In selecting the building to pull down, a more careful watch would need to be kept upon the supply of certain items than of others. The supply of ordinary bricks, for example, would probably not offer much difficulty, but that of glass would need to be very closely watched, since there would be no effective substitute available for it if the supply proved inadequate, and in that event the new building would at best be imperfect, and might indeed be quite useless for the purpose for which it is required. Similarly, certain of the amino-acids concerned in the make-up of proteins are more important than others because they are irreplaceable for one or other of the purposes of the animal. It is absolutely essential, for example, for the purposes of growth that the protein of the food supplied to the growing animal shall yield on digestion, adequate amounts of the amino-acids lysine, tryptophane and cystine, and possibly others. If any one of these is missing no growth can take place; if it is present, but not in adequate quantity, the full rate of growth cannot be developed. The same considerations arise in connexion with maintenance, and with the production of milk and eggs.

In stating the protein requirement of an animal, therefore, the figure for *quantity* of protein must be accompanied by a proviso, expressed or implied, that this quantity on digestion will supply the animal with at least the minimum necessary amount of each of the *essential* amino-acids. In other and simpler words, the protein supply must be adequate not only in quantity but also in "quality" or "biological value."

Returning again to our simile of the building, just as the builder in selecting the building to provide his material for erecting the new house will endeavour to find one that will

NOTES ON FEEDING

give him what he needs with as little waste as possible, so also in deciding upon the protein supply for the animal we ought to select a protein, or mixture of proteins, that will give just sufficient of each essential amino-acid and cover the general protein needs without waste; in short, the make-up of the protein should be nicely "balanced." (Economic considerations may, of course, sometimes induce both builder and rationer to use a more wasteful supply, provided that it furnishes the *essentials*.)

Unfortunately the study of the chemical make-up of the proteins is a difficult and tedious business, and consequently as yet we can only give reliable guidance on protein "quality" over a very limited range of the commonly-used feeding stuffs. In practice, therefore, we are usually obliged to adopt the expedient of seeking safety in variety, trusting that *between them* the proteins of the various foods we blend together will at least provide the necessary amounts of the *essential* amino-acids. If we are lucky the supply of the non-essential amino-acids will also be adequate without being excessive, but we can have no certainty as to the latter.

Whether we have really secured variety in our ration from the point of view of protein quality will depend upon the origin of the materials. Thus a mixture of maize, maize germ meal, maize gluten feed and maize bran would be simple rather than varied, since all its proteins come from maize. A mixture of maize, rice meal, wheatfeed and linseed cake, on the other hand, would be varied, since each item is entirely different in origin.

Protein Minimum and Optimum. In stating protein requirements, it is also necessary to be clear as to the precise significance of the figure given. Experimental work on protein requirements usually takes the form of determining the lowest amount of food protein that will maintain the animal body in protein equilibrium, i.e., neither gaining nor losing protein.

The figure obtained is thus the *minimum* requirement *under the conditions of the experiment*. Experiments are necessarily confined to limited periods, and strictly speaking the conclusions drawn are only valid for such periods, until confirmed either by experimental work or practical experience over longer periods. This consideration must be kept in mind when applying the results of experiments to farm feeding practice, especially where the experimental results suggest that a very low level of protein supply will be adequate.

NOTES ON FEEDING

In short-period studies of maintenance requirements, for example, protein equilibrium has been maintained at levels of protein supply much below those found to be desirable in practice. Over short periods the maintenance protein requirement of cattle may be covered by a daily supply of 0.3 lb. of digestible protein per 1,000 lb. live-weight, but when this has been tried over long periods, both in America and in Denmark, it has been found that the health of the cattle eventually suffered in comparison with that of others that were getting a rather more liberal supply. In the Danish test this was very obvious in the appearance of the animal, which quickly improved when the supply of protein was increased.

Practical experience also indicates the undesirability of basing the protein standards for *production* purposes on the experimental minima. For example, a working horse expending a certain amount of energy needs no more protein to keep it in protein equilibrium than a fattening bullock of the same weight storing up the same amount of energy, but the application of the bullock-feeding standard to the feeding of the horse would certainly not give satisfactory results in practice.

It is thus necessary to discriminate between the "absolute minimum" protein requirement, which is of scientific interest only, and the "optimal minimum" or "practical minimum," this being the lowest amount that in practice will cover the protein needs of the animal consistent with the maintenance of health and vigour and the efficient discharge of any productive effort required. The protein data in tables of feeding standards must clearly be based upon the latter and must therefore be interpreted as representing the minimum amounts of digestible protein of average "biological value" that will be required by the average animal under average practical conditions to perform efficiently the task assigned to it.

Protein Requirement and Live-weight. It is customary to state protein requirements for maintenance in terms of a definite live-weight, but it is not yet possible to say definitely whether the protein requirement rises and falls in direct proportion to the live-weight, or more nearly in proportion to the total energy requirements for maintenance, which, as explained in last month's Notes, vary more nearly in proportion to body surface. Broadly speaking, it may be expected that the maintenance protein requirements will be determined partly by the size and partly by the *activity* of the animal,

NOTES ON FEEDING

and since the latter factor is generally greater with the smaller than with the larger types of animal we shall probably not commit any serious error if we assume a constant ratio between protein requirement and general energy requirement (starch equivalent) for the maintenance of different-sized animals of the same class.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	5 12
Maize	78	7.6	4 17
Decorticated ground-nut cake	73	41.3	6 18
„ cotton-seed cake	68	34.7	7 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1.42 shillings, and per unit protein equivalent, 1.29 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 15
Oats	60	7.6	4 15
Barley	71	6.2	5 9
Potatoes	18	0.8	1 7
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 10
Beans	66	19.7	5 19
Good meadow hay	37	4.6	2 18
Good oat straw	20	0.9	1 10
Good clover hay	38	7.0	3 3
Vetch and oat silage	13	1.6	1 1
Barley straw	23	0.7	1 14
Wheat straw	13	0.1	0 19
Bean straw	23	1.7	1 15

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	6 13	0 8	6 5	72	1 9	0·94	9·6
Barley, British feeding ..	5 10	0 8	5 2	71	1 5	0·76	6·2
" Persian	5 3*	0 8	4 15	71	1 4	0·71	6·2
" Polish	5 15	0 8	5 7	71	1 6	0·80	6·2
" Russian	5 17	0 8	5 9	71	1 6	0·80	6·2
Oats, English, white ..	6 7	0 9	5 18	60	2 0	1·07	7·6
" " black and grey ..	6 7	0 9	5 18	60	2 0	1·07	7·6
" Scotch, white ..	6 12	0 9	6 3	60	2 1	1·12	7·6
" Canadian, No. 3 Western ..	6 5†	0 9	5 16	60	1 11	1·03	7·6
" Canadian, mixed feed ..	5 10†	0 9	5 1	60	1 8	0·89	7·6
Maize, Argentine ..	4 17	0 7	4 10	78	1 2	0·62	7·6
" South African, No. 2 white flat	4 15†	0 7	4 8	78	1 2	0·62	7·6
Beans, English, Winter	5 10§	0 17	4 13	66	1 5	0·76	19·7
Peas, Japanese	16 5†	0 15	15 10	69	4 6	2·41	18·1
Dari	6 12†	0 8	6 4	74	1 8	0·89	7·2
Milling Offals:—							
Bran, British	5 7	0 15	4 12	43	2 2	1·16	9·9
" broad	6 7	0 15	5 12	43	2 7	1·38	10
Middlings, fine, imported ..	5 12	0 13	4 19	69	1 5	0·76	12·1
Weatings†	5 15	0 14	5 1	56	1 10	0·98	10·7
" Superfine† ..	6 7	0 13	5 14	69	1 8	0·89	12·1
Pollards, imported ..	5 0	0 14	4 6	50	1 9	0·94	11
Meal, barley	7 2	0 8	6 14	71	1 11	1·03	6·2
" " grade II ..	6 7	0 8	5 19	71	1 8	0·89	6·2
" maize	5 10	0 7	5 3	78	1 4	0·71	7·6
" " South African	5 2	0 7	4 15	78	1 3	0·67	7·6
" " germ	5 10	0 11	4 19	84	1 2	0·62	10·3
" locust bean ..	7 15	0 5	7 10	71	2 1	1·12	3·6
" bean	8 0	0 17	7 3	66	2 2	1·16	19·7
" fish (white) ..	13 5	2 2	11 3	59	3 9	2·01	53
Maize, cooked, flaked ..	5 17	0 7	5 10	84	1 4	0·71	9·2
" gluten feed ..	5 5	0 13	4 12	76	1 3	0·67	19·2
Linseed cake—							
English, 12% oil ..	7 17	1 0	6 17	74	1 10	0·98	24·6
" 9% "	7 7	1 0	6 7	74	1 9	0·94	24·6
" 8% "	7 2	1 0	6 2	74	1 8	0·89	24·6
" 6% "	7 12§	1 0	6 12	74	1 9	0·94	24·6
Soya-bean cake, 5½% oil	8 10*	1 8	7 2	69	2 1	1·12	36·9
Cottonseed cake, English, Egyptian seed, 4½% oil	4 17	0 18	3 19	42	1 11	1·03	17·3
Cottonseed cake, Egyptian, 4½% oil ..	4 7	0 18	3 9	42	1 8	0·89	17·3
Cottonseed cake, decorticated, 7% oil ..	7 0†	1 8	5 12	68	1 8	0·89	34·7

PRICES OF FEEDING STUFFS (continued).

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Cottonseed meal, decorticated, 7% oil ..	7 0†	1 8	5 12	70	1 7	0·85	36·8
Coconut cake, 6% oil ..	6 2	0 18	5 4	77	1 4	0·71	16·4
Ground - nut cake, 6-7% oil ..	6 0*	0 18	5 2	57	1 9	0·94	27·3
Ground - nut cake, decorticated, 6-7% oil	7 5	1 8	5 17	73	1 7	0·85	41·3
Ground - nut cake, im- ported decorticated, 6-7% oil ..	6 12	1 8	5 4	73	1 5	0·76	41·3
Palm - kernel cake, 4½-5½% oil ..	6 5†	0 12	5 13	73	1 7	0·85	16·9
Palm-kernel cake meal, 4½% oil ..	6 2†	0 12	5 10	73	1 6	0·80	16·9
Palm - kernel meal, 1-2% oil ..	5 7	0 12	4 15	71	1 4	0·71	16·5
Feeding treacle ..	4 12	0 8	4 4	51	1 8	0·89	2·7
Brewers' grains, dried ale	4 10	0 11	3 19	48	1 8	0·89	12·5
Brewers' grains, dried porter ..	4 2	0 11	3 11	48	1 6	0·80	12·5
Dried sugar-beet pulp (a)	5 12	0 5	5 7	66	1 7	0·85	5·2

(a) Carriage paid in 5 ton lots. * At Bristol. § At Hull. † At Liverpool.
† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the beginning of May, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £9 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £8. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N., 7s. 3d.; P₂O₅, 2s. 3d.; K₂O, 3s. 5d.

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The Agricultural Index Number

THE general index number of prices of agricultural produce during April is 123 (corresponding month of 1911-13 = 100) or 7 points higher than in March and 4 points above the figure recorded a year ago. (If allowance is made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the month under review becomes 129.) The principal commodities used in compiling the general index which showed a rise in price compared with the preceding month were wheat, oats, fat cattle and fat sheep, while barley, fat pigs, eggs, butter and milk were lower in value.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	—
June	123	111	100	110	111	—
July	121	106	101	114	114	—
August	121	105	105	119	113	—
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Grain. The average price for wheat at 6s. 5d. per cwt. was 2d. higher than in March and the index advanced by 1 point to 85. (If "deficiency payments" under the Wheat Act are taken into consideration, the index stands at 122.) Barley at 7s. 4d. per cwt. was reduced by 3d.; a corresponding fall, however, took place during the base period and the index remained unaltered at 96. A rise of 1d. was recorded

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for oats (6s. per cwt.), the index moving upwards by 1 point to 85. In April last year wheat averaged 4s. 10d., barley 7s. 2d. and oats 6s. 11d. per cwt., the relative indices being 64, 93 and 98.

Live Stock. Fat cattle, at 33s. 9d. per live cwt. for second quality, were higher in price by 1s. 1d. on the month; a somewhat larger rise, however, occurred during the base period and the index declined by 1 point to 92. Both the index figure and the price show advances on those recorded a year ago, the former by 6 points and the latter by 2s. 1d. per live cwt. The effect of adding the cattle subsidy would raise the index to 106. Values for fat sheep at 10½d. per lb. for second quality showed a decided advance, and the index moved upwards from 115 to 128 points. Prices for fat pigs depreciated, second quality baconers averaging 11s. 1d. and second quality porkers 11s. 10d. per score, or 2d. and 6d. lower than a month ago. The index figures declined from 112 to 111 and from 117 to 112 respectively.

As regards store livestock, dairy cows again cheapened, and at 100 the index is 2 points below that of March, 1936. On the other hand store cattle and sheep were dearer, the relative indices advancing from 92 and 102 to 94 and 109. Pigs declined in value, the index falling by 1 point to 122.

Dairy and Poultry Produce. The rise in the milk index is essentially due to the average seasonal fall between March and April in the base period having been considerably greater than that between the same two months this year. Seasonal reductions in prices for butter and eggs were also evident, but again the effect on index numbers was offset by similar falls in 1911-13, the respective figures being little altered at 96 and 107. Cheese rose by 2s. per cwt. and the index appreciated by 3 points to 100. Prices for fowls and ducks were unchanged on the month, but the indices for both are lower at 112 and 118, owing to increases in the base levels.

Other Commodities. During the month under review potatoes were slightly lower in value, and as a rise occurred during the base period the fall was accentuated, viz., from 193 to 164 points. Hay prices continued to show a slight decline, the combined index depreciating by 2 points to 79. Quotations for wool tended upwards and the index figure at 97 was 1 point higher than in March.

MISCELLANEOUS NOTES

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	Apr.	Apr.	Jan.	Feb.	Mar.	Apr.
Wheat	57	64	85	85	84	85
Barley	103	93	101	98	96	96
Oats	84	98	87	85	84	85
Fat cattle	95	86	97	96	93	92
„ sheep	128	141	127	119	115	128
Bacon pigs	125	108	107	111	112	111
Pork „	126	113	115	114	117	112
Eggs	99	96	115	118	109	107
Poultry	119	116	127	122	120	115
Milk	168	215	171	171	171	215
Butter	91	89	93	93	95	96
Cheese	117	91	93	95	97	100
Potatoes	89	95	201	200	193	164
Hay	80	99	83	83	81	79
Wool	96	83	96	96	96	97
Dairy cows	103	99	105	103	102	100
Store cattle	84	85	94	92	92	94
„ sheep	95	107	105	104	102	109
„ pigs	137	122	134	129	123	122

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	125*	114*	126*	125	125	122
Fat cattle .. ..	..	100	111	110	107	106
General Index	116*	126	124*	123	122	129

* Superseding figures previously published.

Foot-and-Mouth Disease. No outbreaks of Foot-and-Mouth Disease have been confirmed since January 26. At the time this issue of the *Journal* went to press, no part of Great Britain was subject to Foot-and-Mouth Disease (Infected Arcas) restrictions.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, May 26, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board received notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following orders :—

Dorset.—An Order fixing minimum and overtime rates of wages to come into operation on July 1, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until June 30, 1937. The minimum rates in the case of male workers of 21 years of age and over are 31s. (instead of 31s. 6d. as at present) per week of 51

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hours (instead of 53½ hours as at present) in summer, except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 42 (instead of 44 as formerly) and 48 hours in winter except in the week in which Christmas Day and Boxing Day fall when the hours are 31, and in the case of female workers of 21 years of age and over (other than part time and casual workers) unchanged at 24s. per week of 48 hours, except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall when the hours are 39½, and in the week in which Christmas Day and Boxing Day fall when the hours are 31, with, in addition, in the case of all workers referred to above, not more than 3 hours on Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day respectively on work in connection with milking and the care of and attendance upon stock. In the case of part time or casual female workers of 18 years of age and over the minimum rate is 5d. per hour. The overtime rates are unchanged at 8d. per hour for male workers of 21 years of age and over (except for overtime employment in the hay and corn harvests when the rate is 9d. per hour) and 6d. per hour for all classes of female workers of 20 years of age and over.

Hertfordshire.—An order fixing special overtime rates for employment during the hay harvest of 1936. The overtime rate for male workers of 21 years of age and over is 10d. per hour, and for female workers of 19 years of age and over 7½d. per hour.

Lincolnshire (Kesteven and Lindsey).—An order fixing special overtime rates for employment of male workers on the corn harvest in 1936, the rate for workers of 21 years of age and over being 1s. 3d. per hour (instead of 1s. per hour as in 1935).

Shropshire.—An Order varying the existing minimum and overtime rates of wages as from June 1, 1936, the rates as varied to remain in operation until May 31, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 32s. as at present) per week of 54 hours with overtime unchanged at 9d. per hour on weekdays and for attention to stock on Sundays, and 10d. per hour for other employment on Sundays. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour with overtime at 6d. per hour.

Suffolk.—An Order cancelling the existing minimum and overtime rates of wages for male workers and fixing fresh rates in substitution therefor to come into force on June 1, 1936, and to continue in operation until May 29, 1937. The minimum rates for male workers of 21 years of age and over are 31s. 6d. (instead of 31s. as at present) per week of 50 hours in summer, except in the week in which Good Friday falls when the hours are 41½, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, with, in addition, in the case of horsemen, cowmen and shepherds of 18 years of age and over, the sum of 6s. per week to cover employment up to 10 hours per week in connection with the immediate care of animals. The overtime rate for all male workers of 21 years of age and over is 9d. per hour (as at present).

Worcestershire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on June 1, 1936, and to continue in operation until February 28, 1937. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 52 hours (instead of 53½ hours as at present) in any week in summer and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, with overtime unchanged at 9d. per hour. The minimum rates for

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female workers of 18 years of age and over remain unchanged at 5*d.* per hour with overtime on Sundays and in excess of 8 hours on any other day at 5½*d.* per hour.

Enforcement of Minimum Rates of Wages.—During the month ending May 13, 1936, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Hereford ..	Harewood				
	End	4 0 0	5 0	22 15 6	1
Lancs. ..	Rochdale	4 0 0	2 6	39 8 9	2
Monmouth	Newport	10 0	—	23 15 0	2
Notts ..	Nottingham	2 2 0	1 3 6	48 5 0	2
Yorks E.R.	Howden	1 10 0	10 0	8 12 6	2
Glamorgan	Gowerton	1 0 0	2 2 0	26 13 6	1
"	Llantrisant	2 0 0	13 0	33 3 0	2
"	"	1 0 0	6 6	22 1 0	1
		16 2 0	5 2 6	224 14 3	13

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATIONAL STAFFS: ENGLAND

Nottinghamshire : Mr. F. H. Jones, N.D.P., has been appointed County Poultry Instructor, *vice* Mr. W. M. Gair.

THE RUBBER RESEARCH INSTITUTE, MALAYA

The High Commissioner for the Malay States has appointed Mr. H. J. Page, M.B.E., B.Sc., F.I.C., to the post of Director of the Rubber Research Institute, Malaya, in succession to Lieut.-Col. B. J. Eaton, O.B.E., who is shortly retiring. Mr. Page, who is at present Controller of Agricultural Research at the Jealotts Hill Research Station of Imperial Chemical Industries, Ltd., will be leaving England for Malaya next month (July).

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Annuaire Agricole De La Suisse. Part II. Pp. 103-207. (Berne : Département Fédéral de l'Economie publique. 1936. Price 6 *fr.*)

Some of the articles in the journal under review are of interest to readers outside Switzerland, in particular an article in the current number on the storage of fruit under normal conditions. It is pointed out that the use of improved technical methods in Switzerland has resulted in larger crops of fruit that is of better quality ; attention has therefore, been concentrated upon determining the most suitable methods of storage. Cold stores are rare in Switzerland and the methods are suitable for small farmers or private persons, using ordinary premises or ventilated cellars, to adopt. The factors that affect ripening of the fruit are discussed, and

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the importance of keeping the temperature as low as possible, with a humidity of 83-88 per cent. is emphasized; owing to the cold air of winter being dry, watering the floor of the cellar is frequently necessary in winter. The importance of careful picking and the selection of sound, unblemished fruit is emphasized, and attention is drawn to the advantages of arranging the fruits in single layers on trays. As a further preventive of rotting it is recommended that fruit, after gathering, should be washed in a 4 per cent solution of soda in warm water. The most interesting part of the paper concerns experiments carried out to control loss of weight of the fruit, and it is recommended that the fruits be rubbed lightly with bees-wax or be stored, after wrapping them in paper to prevent staining, in peat moss litter. These methods were found to be superior to wrapping the fruits in paper impregnated with paraffin wax and especially desirable for fruits that easily become wrinkled, e.g., Belle or Boskoop and Reineter due Canada, but less necessary for varieties such as Cox's Orange Pippin, Jonathan, Calville blanc, which wrinkle less readily during storage. This work offers a suggestive line of study to workers with other varieties and in other countries.

Cultivated Crop Plants of the British Empire and the Anglo-Egyptian Sudan (Tropical and Sub-Tropical).—Bulletin of Miscellaneous Information: Additional Series XII. By H. C. Sampson, C.I.E., B.Sc., F.L.S. Pp. viii + 251. (London: His Majesty's Stationery Office. 1936. Price 6s. 6d.)

The information furnished in this inventory of cultivated crop plants is based on replies to a questionnaire issued by the Director of the Royal Botanic Gardens, Kew, and forwarded to all tropical and sub-tropical countries of the British Empire and to the Anglo-Egyptian Sudan. Every effort has been made to ascertain the correct name of each species, and since a plant may sometimes be better known by one of its synonyms, a list of these is given in the appendix. The entries of each species are arranged in the following manner. First, the specific name is given, with that of the authority responsible for it. Common synonyms, if any, are placed within brackets immediately after the accepted name. The next entry is the presumed country or countries of origin. Where necessary, a brief description of the nature and uses of the plant are stated, and what parts are useful. Then follow the countries where the crop is now being grown, or has been tried. After the list proper comes a section entitled "Crop Notes" dealing with the more important species and adding bibliographies.

Die Methoden zur Bestimmung des Kali und Phosphorsäurebedarfs landwirtschaftlich genutzter Böden. (*Methods for determining the potash and phosphoric acid requirements of farm soils.*) By Dr. Walter Ulrich Behrens. Pp. 196. 1935. (Berlin, W. 35: Verlag Chemie G.m.b.H., Corneliusstrasse 3. Price (outside Germany) R.M. 12.)

A very large proportion of Continental literature in soil science and agricultural chemistry is devoted to the search for adequate methods of estimating manurial requirements by means of soil analysis. The factors involved are necessarily complex, and it is extremely difficult to be sure of the basic facts of agricultural experience from which an essentially empirical treatment must start. A method that appears to work well in one district may often fail elsewhere, unless the controlling factors are clearly defined and the range of its application is established by elaborate series of coordinated field experiments. In consequence, most of the numerous discussions on alternative methods and the principles underlying them

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tend to be either very detailed or highly controversial. A critical review of the more important methods will therefore be welcomed by many in this country who have been overwhelmed by the sheer mass of German and other literature on these subjects. Dr. Behrens has given a concise summary of the present position, and his treatment has especial value because he is neither an originator nor a protagonist of a particular method.

As long ago as 1863 the German Agricultural Experiment Stations set up a strong committee of chemists to unify the methods of soil analysis, but the majority then decided that chemical analysis was not particularly suited for the estimation of manurial requirements. Later research has justified their caution, but revealed new methods of approach. The whole subject received a great stimulus after the war by the work of the new Experiment Rings—farmers' associations for local field experiments—which showed that acute nutrient deficiencies were common throughout Germany, especially in districts, such as East Prussia, where there had been little or one-sided use of fertilizers.

In 1923, two novel methods of soil analysis aroused widespread popular interest because they were based directly on growing plants. In Mitscherlich's method oats are grown to maturity in pot cultures with and without added phosphate and potash, and in Neubauer's method rye seedlings are grown for a fortnight or so and analysed to find how much potash and phosphoric acid they absorb from the soil. Both methods, though apparently simple, are considerably more laborious and expensive than the alternative chemical methods, while they may have many pitfalls. Costs were cut, especially in East Prussia, by large-scale organization and by direct and indirect support. The Neubauer method has perhaps had the greater popular success and is now the only one that is thoroughly established in the sense that in each district there is a mass of data related to local experience. Such data might of course be obtained for any of the simpler and cheaper chemical methods, and it is interesting to notice that Dr. Behrens concludes that chemical methods are likely to take the lead in those countries, such as Great Britain, in which the Neubauer method has not already secured a long start.

Up to the present the Egner lactate method for phosphoric acid appears to have been the most successful, but there are insufficient field data to enable one to decide between many of the alternative and closely-related methods or to determine the conditions under which they may be used with reasonable confidence. Dr. Behrens's review of these methods, and his discussion of the comparison of field and laboratory results, should be consulted both by those who are attacking the general problem and those who are making over-enthusiastic claims for a single method on the grounds of some Continental recommendation. The combination of modern soil science and plant physiology with the improved methods of field experimentation is opening the way to a new attack on one of the oldest problems of agricultural science, and it is important that its prospects should not be endangered by unjustified propaganda and promises that may not be fulfilled.

Die Forschungsdienst. Deutschen Landwirtschaftlichen Rundschau.
(*Research Abstracts. German Agricultural Review. New series*).
Published fortnightly. Vol. 1, Nos. 1 to 7 (to date). (Berlin, S.W. 11 :
J. Neumann, Anhalter Strasse 7. Annual subscription R.M. 36.)

There is a large number of abstracting bodies connected with agricultural science throughout the world. Our own Imperial Bureaux cover the field fairly extensively and each publishes abstracts and special bulletins. In America there is the exhaustive "Biological Abstracts" and in Germany there was formerly the "Deutschen Landwirtschaftlichen Rundschau."

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The place of the last publication has now been taken by *Der Forschungsdienst*, a new publication that first appeared this year and is issued fortnightly. The seven parts already published necessarily cover a field that is far too wide to describe in a short notice, but the composition of the periodical is one that will certainly meet with approval. It takes the form of considered articles summarizing particular lines of research, to which are appended exhaustive bibliographies of the current literature, and in addition there is at the end of each issue a collection of short abstracts dealing with particular subjects arranged in accordance with a standard subject index. Necessarily, perhaps, most of the references are to current German literature, but this will make the publication of greater rather than less value, especially to workers in other countries, because the references will undoubtedly include some that would not normally come to the notice of a specialist scientist, however closely he examines the international literature of his subject.

Markets and Men: A Study of Artificial Control Schemes in some Primary Industries. By J. W. F. Rowe. Pp. ix & 259. 1936. (Cambridge University Press. Price 7s. 6d.)

This book is a valuable addition to popular economic literature. The descriptive chapters, which survey the schemes relating to coffee, Canadian wheat, sugar, American cotton, rubber and tin, are largely reproductions from a series of wireless talks delivered by the author in the spring of 1935 in collaboration with Mr. J. Jewkes. They are illustrated by some interesting photographs, and explain fully and clearly the essential facts bearing on the problems which the different schemes have faced. To these chapters has now been added a non-technical discussion of general principles from which certain provisional conclusions are drawn, these being naturally subject to the reservation that a final judgement on some of the schemes still in operation cannot yet be made.

Mr. Rowe's verdict is on the whole unfavourable, but he does not admit a general case either for or against artificial control as contrasted with laissez-faire. The likelihood of success or failure can only be judged by reference to the aim (schemes that aim at the restriction of production must be distinguished from valorization schemes which aim at the stabilization of prices by control of marketing), and to the supply and demand conditions in the industry concerned. Valorization schemes receive his cautious approval, but the heavy demands they make on the wisdom of their administrators and the great danger of over-optimism are fully illustrated from the history of the wheat, cotton and coffee experiments.

Restrictions of production during a period of general prosperity the author thinks justified only if it is designed to meet a temporary decline in demand for the product of a particular industry. In such circumstances restriction may be desirable in order to preserve productive capacity likely to be required again in the near future: but it cannot deal with the problem of permanent over-capacity in relation to normal demand, especially if part of the capacity is high-cost and obsolescent. Some of the capacity in the latter case will sooner or later have to be eliminated, and restriction is likely to aggravate the difficulty rather than bring it nearer solution. Thus, of the restriction schemes in operation before 1929 only one fulfils Mr. Rowe's conditions—the Stevenson rubber scheme in its earlier stages. That this scheme later ended in failure was not due to its initial unsoundness, but to its continuance after demand had revived, with the business recovery in the United States, and to its consequent transformation from a method of meeting an emergency into an attempt at monopolistic exploitation. The other pre-1929 schemes here surveyed—the Cuban sugar scheme, Copper Exporters Inc., and the tin restriction

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proposed (but not adopted) in 1929—did not fulfil the essential conditions, and the two that were put into operation could not have succeeded, in Mr. Rowe's opinion, even though there had been no world slump in 1929.

Under circumstances of world depression Mr. Rowe is prepared somewhat to relax his conditions and to admit that restriction, even where it is no permanent cure, may serve to postpone the necessity for far-reaching adjustments until, with a return to prosperity, they can be more easily achieved. To regard restrictions, however, as a panacea is highly dangerous. "The truth is that restriction is an extremely powerful drug, which in wise and discriminating hands can be used to effect great improvements in the world's economic organization; but if used as a panacea it will certainly bring some patients near to death."

It should be added that Mr. Rowe's conclusions are not meant to apply to agricultural marketing schemes of the type now in operation in this country. Schemes of this kind are not discussed in his book.

Soils: Their Origin, Constitution and Classification. An Introduction to Pedology. By G. W. Robinson. Second Edition. Pp. xvii & 442 and 17 Figs. 1936. (London: Thomas Murby and Co. Price £1.)

The fact that a second edition of Professor Robinson's *Soils* has been called for in a little over three years is evidence both of the excellence of the book and of the rapidly increasing interest in pedology. Workers in many other branches of pure science, as e.g., geology, botany, geography, find in the new approach to soils material which bears directly on their own problems. Workers in the agricultural sciences have come to realize the limitations of the older methods of relying on rough-and-ready field trials and laboratory investigations on samples of surface soil. In many countries vital questions of soil conservation, maintenance of fertility, land reclamation and agricultural planning, for restriction or expansion, raise practical problems, for which the older methods of attack are quite inadequate, but for which there is more promise in newer ones based on the soil profile as the natural unit. Up to the present only the merest outlines have been developed, and preliminary surveys with critical studies on typical soils are urgently needed in many areas. For the time being this work must generally be undertaken by people trained in other sciences or in the older methods, and for them there is no better introduction than Professor Robinson's book. Those who are more directly concerned with the agricultural use of soils, should, however, be warned that problems of soil fertility and soil management receive only a superficial treatment. Professor Robinson prefers the pursuit of fundamental knowledge on soils and plant nutrition to the direct attack, which he dismisses in the following words: "Field experiments must always be carried out, particularly in undeveloped countries face to face with new problems, but the writer would deplore any avoidable diversion of material resources and creative thought into this pedestrian type of investigation, which opens out no new horizons, but merely answers the commonplace questions it is required to solve."

The new edition differs from the first, chiefly by the incorporation of quite recent work on the clay complex, base exchange, and soil moisture, fuller discussions on pedogenic processes and soil classification, and a greatly increased bibliography. The appendix on methods of soil analysis has been withdrawn in view of Mr. C. H. Wright's recent book on the subject. The reviewer commented on the poorness of the illustrations in the first edition and is glad to acknowledge the improvement both in numbers and quality in the new edition. The frontispiece now shows a good Tschernosem profile with the pedologist's apparatus—spade, auger and measuring rod.

ADDITIONS TO THE LIBRARY

Agricultural Progress. Vol. XIII. Pp. 190. 1936. (Cambridge : W. Heffer & Sons, Ltd. Price 5s.)

The new number of this annual publication comprises sections on agronomy, dairying, poultry, agricultural chemistry, economics, education, and husbandry, each containing articles by well-known writers on their respective subjects. The Report on the Organization of Systematic Courses of Instruction, by Professor N. M. Comber and Mr. E. Rea, will be read with interest by all who are concerned with agricultural education. The issue concludes with notes, reviews of books, and a record of recent activities of the Agricultural Education Association—of which *Agricultural Progress* is the official organ.

ADDITIONS TO THE LIBRARY

Horticulture.

Day, H. A.

Your Flower Garden. How to Grow Perfect Flowers in Town and Country. (viii + 151 pp.) London : Methuen & Co., 1936, 3s. 6d.

Sudell, R.

The New Garden. (348 pp. + 20 plates.) London : The English Universities Press, 1935, 5s.

Elliott, C.

Rock Garden Plants. (328 pp. + 17 plates.) London : Edward Arnold & Co., 1935, 7s. 6d.

Macmillan, H. F.

Tropical Planting and Gardening with Special Reference to Ceylon. (4th Edition.) (x + 560 pp. + 3 Coloured plates and Plan.) London : Macmillan & Co., 1935, 25s.

Miles, H. W. and Mary.

Insect Pests of Glasshouse Crops. Edited by H. C. Long, foreword by J. C. F. Fryer. (174 pp. + 21 plates.) Published by H. C. Long, "The Birkins," Orchard Road, Hook, Surbiton, Surrey, 1935, 8s. 6d.

Monro, G., Ltd.

The Protection of Crops against Frost. (28 pp.) Published by Authors at Hertford Road, Waltham Cross, Herts, 1936, 2s. 6d.

Lloyd, J. W.

Productive Vegetable Growing, Edited by K. C. Davis. (7th Edition revised.) (viii + lxxii + 343 pp. + 1 plate.) Chicago and Philadelphia : Lippincott, 1935, 12s. 6d.

Dakers, J. S.

Early Vegetables under Glass. (viii + 171 pp. + 8 plates.) London : Cassell & Co., 1936, 2s. 6d.

Defries, A.

The Book of the Mushroom. (xiv + 130 pp. + 12 pp. plates.) London : Methuen & Co., 1936, 5s.

Markham, E.

Raspberries and Kindred Fruits. How to obtain Fresh Supplies daily from June to November with Chapters on the Loganberry Hybrid Berries and Giant Blackberries. (vii + 68 pp. and 10 plates.) London : Macmillan & Co., 1936, 6s.

ADDITIONS TO THE LIBRARY

Dugdale, Rose S.

Fragrant Herbs Culled from Many Gardens. (44 pp.) Birmingham: The Weather Oak Press, 1935, 3s. 6d.

Institut International d'Agriculture.

Actes de la conférence diplomatique internationale pour l'unification des méthodes d'analyse des vins dans le commerce international. (Rome 4-5 Juin, 1935.) (105 pp.) Rome: Villa Umberto, 1936, 15 liras.

Livestock and Poultry.

Fitzgerald, D. A.

Livestock under the A.A.A. (xiii + 384 pp.) Washington: The Brookings Institution; London: Faber & Faber, 1935, 11s. 6d.

Abbey, Mrs. Arthur.

Practical Goat-Keeping. (114 pp. + 8 plates.) London: Cassells, 1935, 1s. 6d.

The Feathered World Year-Book and Poultry-Keepers' Guide for 1936. (301 pp. + 16 pp. plates.) London: 2s.

University of Bristol Department of Agriculture.

Bulletin No. 14:—Profits and Losses in Poultry Farming. C. V. Dawe and S. R. Wragg. (27 pp. mimeo.)

Dairying, etc.

Murray, A. H. (Editor).

The World's Handbook of Dairying. The Standard Book of Reference to the Dairy Trade. (211 pp.) Wells: Clare's, 1935, 5s.

Black, J. D.

The Dairy Industry and the A.A.A. (xiv + 520 pp.) Washington: The Brookings Institution; London: Faber & Faber, 1935, 13s. 6d.

Davies, W. L.

The Chemistry of Milk. (xii + 522 pp.) London: Chapman & Hall, 1936, 25s.

Privy Council, Medical Research Council.

The Bacteriological Grading of Milk, G. S. Wilson et al (Special Report Series No. 206). (392 + xii pp.) London: H.M. Stationery Office, 1935, 7s. 6d.

American Public Health Association and Association of Official Agricultural Chemists.

Standard Methods of Milk Analysis, Bacteriological and Chemical (6th Edition.) (xiii. + 105 pp.) New York: American Public Health Association, 1934, \$1.50.

The Hannah Dairy Research Institute.

Bulletin No. 6:—An Enquiry into the Design, Operation and Efficiency of Pasteurizing Plants. (ix + 72 pp.) Kirkhill, Ayr, 1935, 3s.

Hunziker, O. F.

Condensed Milk and Milk Powder. (5th Edition.) (661 pp.) The Author, La Grange, Illinois, 1935, \$7.00

Burdett, O.

A Little Book of Cheese. (viii + 99 pp.) London: Gerald Howe, 1935, 3s. 6d.

The Institute of British Geographers.

Publications Nos. 1 and 2. (1) Transactions and (2) The Pastoral Industries of New Zealand, R. O. Buchanan. (xv + 84 pp. and maps and graphs.) London: George Philip & Son, 1935, 7s. 6d.

WIRELESS TALKS TO FARMERS

Meat.

Anthony, D. J. and Blois, W. G. T.

The Meat Industry. (A Text Book for Meat Traders and Others Engaged in the various Branches of the Meat Industry.) (2nd edition.) (xii + 256 pp.) London: Baillière, Tindall & Cox, 1931, 7s. 6d.

The Frozen and Chilled Meat Trade: A Practical Treatise by Specialists in the Trade. London: Gresham Publishing Co., 1929, 30s., 2 vols.

WIRELESS TALKS TO FARMERS, JUNE, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : June 3, 10, 17, and 24	7.5	Prof. J. A. Scott Watson and others	For Farmers only.
West : June 2	6.30	Mr. John Red- cliffe	Farmer's Tales. How the farmers and country people are using the Bank Holiday.
June 10	7.50	Various speakers	Village Opinion. Local Self-Government and the Village.
Week beginning June 21	Not fixed	Various speakers	Village Opinion. Some Village Utopias.
Week beginning June 28	Not fixed	Not fixed	For Western Farmers in Particular.
June 28	Not fixed	Not fixed	Royal Show Broad- cast.
Scottish : June 4	6.30	Messrs. Norman C. Wright and T. G. Hender- son	For Scottish Farmers : Milk Manufacturing.
June 11	7.0	Mr. R. L. Scarlett	For Scottish Farmers.
June 18	6.30	Mr. A. R. Wannop	For Scottish Farmers : Farm Organization.
June 23	8.15	Not fixed	At the Highland Show (1).
June 24	8.30	Not fixed	At the Highland Show (2).
June 25	7.0	Not fixed	For Scottish Farmers.
Midland : June 11	8.45	Mr. W. B. Thomp- son and others.	Impressions of the Three Counties Show at Worcester.
North and Welsh :	No Agricultural Talks.		

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XLIII No. 4 July, 1936

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The Ministry's Library

Main Library. The Ministry's Main Library, which contains about 30,000 volumes relating to all branches of agricultural science, is conveniently situated on the ground floor at the Ministry's chief office, 10, Whitehall Place, London, S.W.1. The Library, which forms part of the Publications Branch of the Department, is primarily intended for the use of the Ministry's officers; but for many years past its resources have been at the disposal of the public, arrangements having been made in 1908 under which most of the books may be borrowed by the public. This concession was introduced to enable farmers, agricultural students and others interested, to consult works that might otherwise not be accessible to them; and, in particular, to enable them to refer to special and technical works such as scientific reports published abroad, and to publications of Dominion and foreign Governments. Over 1,000 works are lent annually. The conditions upon which books may be borrowed are obtainable on application to the Ministry.

Large numbers of visitors also call at the Library to consult individual works, or to obtain general information on a certain branch of agriculture. Other callers desire to pursue their investigations into some special subject; and in such instances every effort is made to facilitate their researches, for which an extensive card index is an available aid. In addition, for applicants by post, bibliographies are prepared suggesting sources from which they may obtain the information they require.

During the last few years new textbooks have been added to the Library at the rate of approximately 150 per annum. Large numbers of bulletins, monographs, reports, etc., published by Agricultural Departments, Research Institutes, Experimental Stations, Schools and Colleges in all parts of

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the world are also obtained; and the Library is, therefore, in possession of up-to-date information on work being done in connexion with agricultural science.

The complete catalogue of the Library is in card index form, based on the International decimal system. A selected and classified list of modern textbooks filed in the Library has been issued in the Ministry's Bulletin series,* and lists of "Additions to the Library" and of "Selected Contents of Current Periodicals" are published in this JOURNAL from time to time.

The Library also contains a valuable collection of early agricultural books, such as the County Reports of the old Board of Agriculture (1793-1822), the works of Arthur Young, William Marshall, John Sinclair, etc. Many of these are rare works, and books published before 1850 cannot be borrowed. They may, however, be consulted in the Library on application to the Librarian. A chronological list of these early works was published in the year 1930.†

Another item of special interest is the Cowan Memorial Library of books on beekeeping. This unique collection was made by the late Dr. Thomas William Cowan, the founder of the British Beekeepers' Association. It comprises over 1,800 volumes consisting solely of literature devoted to bees and allied interests, and includes many old works of antiquarian interest, which have also been noted in the chronological list referred to above. This Library was purchased by the British Beekeepers' Association and presented to the Ministry as a memorial to Dr. Cowan.

In addition to the Main Library there are also three Branch Libraries.

The Plant Pathological Library is situated at Harpenden, Herts, and consists of approximately 2,600 volumes. These relate mainly to Mycology, Plant Pathology, Economic Entomology and related subjects, and include not only text and reference books on these subjects, but also long runs—in many cases complete sets—of the more important scientific periodicals in which the results of research work are published.

* Bulletin No. 78. *A Selected and Classified List of Modern Textbooks on Agriculture*. Price 6d., post free 7d.

† *Chronological List of Early Agricultural Works in the Library of the Ministry of Agriculture and Fisheries*. By G. E. Fussell. Price 2s., post free, 2s. 1d.

Both obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

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The Veterinary Library is maintained at the Veterinary Laboratory, New Haw, Weybridge, Surrey, and consists chiefly of bound volumes of scientific periodicals, together with a small collection of textbooks mainly on veterinary and medical subjects and related sciences. The total number of volumes is approximately 2,000, excluding reprints and reports; and 56 current periodicals are received.

(The Library of the Imperial Bureau of Animal Health, figures for which are not included in those given above, is also housed in the Laboratory premises.)

The Fisheries Library is divided into two main sections, one at the Headquarters of the Fisheries Department of the Ministry, 43, Parliament Street, S.W.1, the other at the Fisheries Laboratory at Lowestoft. There are two other small sections, one at the Fisheries Experiment Station at Alresford, Hants, and one at the Fisheries Experiment Station, Conway, Caernarvonshire.

The Headquarters section consists mainly of publications relating to the commercial, technical and general aspects of fisheries (both sea and freshwater), official reports and records, and fishery periodicals (foreign as well as British).

The section at the Fisheries Laboratory is the main repository of the scientific fishery publications in the custody of the Ministry. The two smaller sections at Alresford and Conway contain a number of scientific and technical publications relating respectively to freshwater fisheries and pollution questions, and to the purification and breeding of mussels and oysters.

All these Branch Libraries are maintained primarily for the use and assistance of the Ministry's staff; members of the public are, however, admitted to the Fisheries Library at Headquarters, and books in all these collections are available for consultation by (and, in exceptional circumstances, loan to), scientific workers and other interested persons.

The Ministry desires to take this opportunity of recording that many volumes in the Library of this Department have been presented by various donors, who have thus indicated their recognition of the value of the Library generally, and it wishes to express the hope that the Library will continue to receive such presentations. This applies more particularly to old works, of which there must be many in private ownership, that might possibly be very suitably housed permanently where they may be consulted by interested persons.

The Improvement of Grass Land

IN a paper, read before the Royal Society of Arts on May 13, Professor R. G. Stapledon put forward a scheme of Land Improvement and Reclamation that he contended would assist to maintain a large and vigorous rural population; would, by increasing the supplies of fresh foods, such as milk, eggs and meat, tend to ensure the health of the nation; would help to safeguard supplies in time of war; and, incidentally, by employing more labour on the land, would invigorate the countryside. Reclamation and land improvement, he said, meant the plough, and modern methods of getting the most out of grass also meant the plough.

The only security the nation could achieve, as regards food, was to ensure that every available acre of the country should always be in a fertile and ploughable condition, and every farmer skilled in the arts of husbandry. In peace we should produce all the milk, eggs, potatoes and vegetables we needed: in war, we could go a long way on a superabundance of these. If our methods of farming were right, we could in an emergency, easily and at once, concentrate more on cereals also, wheat on wheat lands, rye and oats on other lands; the highest acreage would be ready for the plough, because, if land were ploughed periodically for grass, on a rational rotational system, it could be kept at a level incomparably higher than at the last war crisis. Without the plough, there could be no flexibility in farming, and without flexibility there could be no security for a nation with a limited land surface and a large population.

The greatest endeavour should be made to engender flexibility where now there was none—on the huge acreage at present in permanent grass, and also, as far as possible, on that other vast acreage in rough and hill grazings. Approaching the matter strictly from the point of view of the land, it was not only the miserable derelict land that had to be considered, but our acreage under inferior grass that had never received proper attention, had never been justly appraised, and the potential capacity of which had been grossly underestimated.

In respect of grass land, our standards of attainment could be far higher than they were a generation or two back. That the low productivity of our poorer grass lands was due

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primarily to neglect was a point that needed to be stressed. The yield of good lowland pastures in dry matter per acre, was often 8 or 10 times greater than that of poor upland pastures; but while, by proper manuring and adequate stocking, the yield of the poorest pastures may be doubled, sometimes trebled, the response of the better pastures to manuring is not likely to exceed 50 per cent., and may be very much less. If the poorest pastures were further improved by the introduction of better species of grasses, the yields would be further increased and the grazing season much lengthened, the shortness of the grazing season being the chief defect of really poor grass land. By re-seeding and manuring, poor upland pastures had produced, from October to May, over five times as much edible dry matter as was obtained from pastures not so treated. Lowland fields, giving live-weight increases of no more than 120-200 lb. per acre, had, after proper manuring and re-seeding, given live-weight increases up to and exceeding 700 lb. per acre.

Ignoring all land above the 1,500 ft. contour line, it was an astounding fact that, in round figures, there were 16½ million acres (no less than 43 per cent. of the land surface of England and Wales) in a more or less neglected condition, much of it absolutely derelict, and every single acre capable of radical improvement. He would not admit that there were more than 300,000 acres of permanent grass that, as grass land, could be accounted fully productive and of the highest class. A detailed survey had shown that, of the 2½ million acres of permanent grass in Wales, only about 36,000 acres could be classed as even tolerably good rye-grass pastures.

Drainage, adequate manuring and the introduction of proper species was the basis of good grass land farming. Rye-grass and the other better species were wanted—not *Agrostis* and species even lower in the scale of productivity. Whatever means were adopted for the improvement of grass land, heavy liming and heavy phosphating were the first necessity in many districts. Not only were we not liming, but, taking our grass lands as a whole, phosphates were not being applied in nearly sufficient quantity. Both gave maximum value when pastures were broken and re-seeded. Re-seeding was more important than anything else; only by the introduction of the proper species could really profound improvements, with lengthening of the grazing season, be achieved. This brought in the question of the long-duration

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ley. Briefly, the advantages of the 4-6-year ley, taken over the whole farm, would be that (1) Britain was kept in a ploughable condition; (2) excessive weediness was eliminated; (3) grass lands were more productive and the grazing seasons were lengthened; (4) the pastures were healthier to animals; (5) larger crops of hay can be produced, and there will be much more scope for the production of grass for drying; and (6) the fertility of the whole farm was enhanced.

After dealing with the above points in some detail, Professor Stapledon again stressed the necessity of periodic reploughing in order to keep grass land at maximum productivity. Further, he advocated that grass lands should be surveyed and mapped, that proper inquiry and research should be instituted on the basal problems, and concluded by outlining his proposals for a national scheme for the rehabilitation of the country's grass lands on the lines indicated.

Colorado Beetle

As a result of the spread of the Colorado Beetle into the north-east of France and into Belgium it is probable that it will reach this country by direct flight from time to time.

The measures undertaken for the eradication of the pest on its arrival here will depend for their success on their being carried out in good time. The Ministry of Agriculture is accordingly anxious to obtain as early notification as possible of the discovery of the pest in this country. Potato growers, especially those in Essex, Kent, and Sussex, are asked to keep a close watch on their crops and to inform the Ministry as soon as they discover or suspect the presence of the Beetle.

A full description of the Beetle is given in the Ministry's Advisory Leaflet No. 71.

Any yellowish beetle with black stripes or any red or reddish yellow grub that is found feeding upon potato leaves should be regarded with suspicion. When suspected Colorado Beetles or grubs are discovered, specimens should be placed in a tin box (in which no holes should be punched) with a piece of potato leaf, and the box should be sent to the Ministry of Agriculture, 10, Whitehall Place, London, S.W.1, with a letter stating the exact place where the insects were caught and the name and address of the finder. No other steps should be taken until instructions are received from the Ministry; it is especially important that the

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crop should *not* be sprayed or interfered with in any way, as this is likely to cause the beetles to spread, and an outbreak possibly affecting only two or three square yards may be distributed throughout the field.

The object of these measures is to keep the insect confined to as small an area as possible, so that it may be eradicated without loss of time.

Home-made Lime-sulphur Wash : Precautions in Preparing

THE Home Office have drawn the attention of the Ministry of Agriculture to the dangers that may, in certain circumstances, be attendant on the mixing together of lime and sulphur to make lime-sulphur wash.

Although it is usual and, in most circumstances, preferable, to purchase lime-sulphur solution ready-made in concentrated form, the wash is sometimes prepared direct from lime and sulphur on the farm. In the course of this process sulphuretted hydrogen (a gas having a most offensive odour) is evolved, and this gas might endanger the health of those engaged in or near the work if the process is carried out in or near a building that has no special arrangements for ventilation. There is also a possibility of danger to anyone entering a tank in which the mixing is being done, even though the work is carried out in the open.

Interpretation of Tests of Steam Sterilizers for Dairy Farm Utensils

THE following note has been communicated by Mr. James Mackintosh, O.B.E., N.D.A., N.D.D., National Institute of Dairying, Shinfield, near Reading:—

In the production of clean milk of good keeping-quality it is essential that the utensils used shall be clean and sterile. In practice this means that the utensils must, after thorough washing, be regularly sterilized. For this purpose the application of steam in such a manner as to subject the utensils to a temperature of not less than 210° F. for at least 10 minutes has been found to be superior to all other methods. It has been proved that, with this time/temperature combination, heat penetration to all parts of a sterilizer loaded with utensils is ensured and a reasonable working margin of safety under practical conditions provided.

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Although the use of steam for the sterilizing of dairy utensils has been adopted by many progressive milk producers during the last 15 years, it is only since the introduction of the Accredited Milk Producers' Roll Scheme in 1935, that there has been a widespread demand for sterilizing equipment. Very many different types of sterilizers have been placed on the market and different authorities have carried out tests with the object of obtaining information on the efficiency of the various types for the work for which they are intended.

Sterilizing outfits, where the source of heat is coal, usually consist of two units—a vertical boiler and a steam chest connected by steam pipes. Other types, where the heating agent is oil or electricity, usually consist of one unit and the steam is generated within the steaming chest.

Where tests of sterilizers are carried out it is essential that information should be obtained on those points that influence the efficiency and economy of the plant. The time taken to reach a temperature of 210° F. inside the chest when the latter is full of utensils should not be unduly long; with different types of sterilizers the period may range from 45 minutes to 2 hours. Where the time of the worker in charge of the sterilizer is properly allocated, delay in reaching the necessary temperature may not be a serious defect. In this connexion, the number of times a boiler has to be stoked during a run may be a serious consideration. Unless the steaming capacity of the boiler in proportion to the cubic capacity of the steam chest is ample, excessive attention may be necessary. Moreover, the maintenance of the required temperature for an adequate period of time will be rendered more difficult. The maintenance of the temperature at not less than 210° F. for at least 10 minutes is the chief purpose for which the plant is constructed, and failure in this respect is serious. The temperature inside the chest should be noted by a reliable thermometer fixed in one side of the chest away from the steam inlets, but easily read from the outside.

A supply of hot water for washing purposes should also be obtainable, either from the boiler or by the admission of steam to a tank of water. The amount of water required will vary according to the number of utensils to be washed; on small farms 5 gal. may be sufficient, and on larger farms a supply of up to 10 gal. will be desirable. The size of the units must be considered in relation to the work they have to do, and there is a wide choice. No definite agreement has

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yet been reached as to the size of chest and size of boiler most suitable for the utensils used in dealing with the produce of dairy herds of a given size, and indeed the requirements of herds of the same size will vary according to the methods adopted in the disposal of the milk. Purchasers should make sure that any plant they buy is large enough for the maximum of utensils in general use.

The construction and general convenience in operation should be noted in any comparative tests, although it will rarely be possible to obtain definite information as to rate of depreciation. The amount of fuel used in steam raising is also an important item of which account should be taken.

Facilities now exist, through the Machinery Testing Scheme of the Ministry of Agriculture, whereby sterilizing outfits and other dairy plant and apparatus can be tested under controlled practical conditions. Reports have been issued on a considerable number of such tests and have been of definite value in raising the standard of efficiency and reliability.

Sixth World's Poultry Congress, Leipzig, 1936

THE sixth World's Poultry Congress will be opened on Friday, July 24, 1936, at Leipzig and will continue until August 2. So far, 34 countries, including Great Britain and Northern Ireland, have announced their official participation in this Congress, and it is stated that applications by the various participating countries for accommodation for the national exhibits have been so considerable that the German Congress authorities have found it necessary to provide a further large building. These national exhibits are educational and scientific in character, but there will be also a large exhibit of live stock showing typical specimens of the various breeds of poultry, rabbits and pigeons in the respective countries. Enthusiastic support for the Congress is being shown by poultry breeders throughout Germany, and it is understood that the National Group of German Poultry Breeders has been actively engaged in preparations for the Congress and Exhibition.

The British participation in the Congress, which is being organized by a Joint Committee of the National Farmers' Union and the National Poultry Council, will be on comprehensive lines. A national educational exhibit will be displayed illustrating the work of education and research and the

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commercial development of the industry in this country. The Ministry of Agriculture and Fisheries is contributing £350 towards the cost of this exhibit, the remainder being collected by the British Congress Committee, which is undertaking the whole of the work in connexion with the exhibit. There will also be a representative display of British breeds of poultry, as well as pigeons and rabbits. The list of papers that will be read and discussed at the Congress includes 13 papers from British authors, representing leading scientists, economists and poultry keepers. The discussions at the Congress should prove of particular interest to all concerned with poultry keeping, and special arrangements are being made for the translation of the papers into various languages.

The British Committee has appointed Messrs. Thomas Cook and Sons as official travel agents, and inclusive fares are quoted for attendance at the Congress. So far, some 100 persons in this country have made arrangements to go to Leipzig and have become Congress members.

The official British Delegation will consist of 9 members, namely;

Mr. P. A. FRANCIS, O.B.E., Poultry Commissioner, Ministry of Agriculture and Fisheries, who will be Chief Delegate.

Miss M. M. McLEOD, Department of Agriculture for Scotland.

Mr. J. G. RHYNEHART, Ministry of Agriculture for Northern Ireland.

and the following 6 members nominated by the British Congress Committee:—

Captain S. W. CLIFT (Chairman).

Sir EDWARD BROWN, LL.D.

Mr. S. STREET-PORTER, J.P.

Mr. P. HEDWORTH FOULKES, B.Sc.

Mr. WILLIAM KENNEDY.

Major IAN MACDOUGALL, O.B.E. (Secretary).

Register of Dairy Cattle

VOLUME XIX of the Register of Dairy Cattle has just been published. It contains particulars of 722 cows in respect of which Certificates of Merit have been awarded by the Ministry since October 1, 1935, as compared with 606 cows entered in the previous volume. To be eligible for a Certificate of Merit, a cow must have given, during a period of three consecutive Milk Recording Years, not less than the prescribed yield of milk, and must normally have calved not less than three times during those years. The prescribed yields for the three-

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year periods are 30,000 lb. for Friesians; 27,000 lb. for Ayrshires, Blue Albions, Lincoln Red Shorthorns, Red Polls and Shorthorns; 24,000 lb. for all other breeds or types except Dexters; and 21,000 lb. for Dexters.

The Register contains a statement showing the number and distribution of the yields of the cows of the various breeds entered, and the highest yield certified for each breed for the three years ended October 1, 1935. Of these cows, 11 gave over 50,000 lb. of milk during the three years concerned; 41 over 40,000 and under 50,000 lb.; 84 over 35,000 and under 40,000 lb.; 224 between 30,000 and 35,000 lb.; 195 between 27,000 and 30,000 lb.; 108 between 24,000 and 27,000 lb.; and 2 between 21,000 and 24,000 lb.

Particulars of pedigree bulls of proved milking strain are also given. The condition of entry of a bull in the Register is that its dam and sire's dam have given the standard yield prescribed for their breed or type in any particular Milk Recording Year. Entries relating to 21 bulls are given in the volume.

A list of the Milk Recording Societies of England and Wales, with particulars of each Society and the name and address of its Secretary, is included in the Register.

Dairy farmers and others desirous of acquiring high-yielding, milk-recorded cows that have been regular breeders should find the Register a valuable book of reference.

The Register can be obtained through any bookseller, or from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2., price 1s., post free 1s. 3d. A copy of the volume is issued free to all members of Milk Recording Societies.

Women's Institutes

THE National Federation of Women's Institutes held a successful and enthusiastic meeting at the Royal Albert Hall on May 20. There are now 5,300 Institutes and 58 County Federations. During 1935, the membership increased by 5,000, and the financial position was improved so that it was possible to make a slight reduction in the rate of donation from Institutes. The study of nutrition has continued to occupy an important place in the programmes of Institutes, County Federations, and the National Headquarters. This is highly satisfactory, as there is no more important matter to which the Federation could direct attention than the

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question of nutrition, particularly in relation to the high nutritive value of milk.

Side by side with the study of food values and the practical application of a knowledge of nutrition, the Federation has endeavoured to improve the standards of home-grown produce and the methods of preservation. To assist in this direction, Women's Institutes arrange local produce exhibitions, and the Federation itself organizes a stand at the Royal Agricultural Show. Apart from this development, there are now over 70 Women's Institutes' market stalls in different places in England and Wales, the turnover from which in 1934 was £27,000, of which no less than £25,000 was returned to the producers, some of whom were unemployed men.

The Sub-Committees of the Federation are grouped as follows: Agriculture and Rural Domestic Economy; "Home and Country" (the quarterly magazine of the Federation); International; Music and Dancing; Office and Finance; Organization; Printing; and Marketing. The work of the Sub-Committee on Handicrafts has been assisted by a grant of £450 from the Development Fund, and the Marketing Sub-Committee's work has been assisted by a grant of £500 a year for three years from the Carnegie Trustees.

Farm Crop Variety Trials

A CORDIAL invitation to visit the National Institute of Agricultural Botany during the summer months is extended to all who are interested in agriculture. The function of the Institute is, by accurate field trials, to discover and recommend to farmers the most profitable varieties of the different farm crops. Visitors will be shown various barleys, beans, soya beans, lucerne, maize, mangolds, spring and winter oats, peas, sainfoin, sugar-beet, kale, winter and spring wheat, etc., and will be able to discuss the relative merits of the varieties with members of the staff. With the exception of soya beans, similar trials are carried out at the Institute's sub-stations at Sprowston (Norfolk), Long Sutton (Hants), Cannington (Somerset), Newport (Salop) and Askham Bryan (Yorks), and those situated near any one of these sub-stations may find it more convenient to visit them rather than Cambridge. July is the best month. Visitors are welcome either singly or in parties, but arrangements should be made beforehand by writing to the Secretary, N.I.A.B., Huntingdon Road, Cambridge.

EGG QUALITY: THE INFLUENCE OF CLIMATE AND SOIL

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Ministry of Agriculture and Fisheries.

MANY inspections of consignments of eggs at packing stations, and at wholesalers' premises, make it apparent that initial egg quality and subsequent rate of deterioration vary considerably.* Quite apart from differences connected with breeding and feeding, other factors are involved that largely affect the quality of the eggs. The inspections suggest that a fundamental cause of the varying quality of the eggs may be attributed to geographical factors. The purpose of this paper is to ascertain the areas of differing quality and to indicate probable explanations of the differences. The commercial value of further investigation is obvious.

The definition of a "quality area" presents the first obstacle. Quality has been regarded as the keeping property or stamina of the egg; flavour may be ignored for the present purpose. Data relating to egg quality throughout England and Wales do not exist, but the difficulty has been surmounted by using the results of many inspections carried out during the last few years. The inspections consist of examinations of several thousand consignments of eggs, carried out on the premises of wholesalers. As the eggs were usually five to ten days old from the date of packing, at the time of the inspections, the differences observed in the quality of the eggs were presumed to indicate the differing rate of deterioration. It has also been necessary to assume that the standard of quality at the time of packing at the two hundred or so stations was similar, although the candling carried out at the packing stations will not always show such differences as an excessive amount of thick white, which apparently affects the rate of deterioration considerably. However, other factors influence the rate of deterioration, and it must be borne in mind that the initial quality of the egg and the subsequent rate of deterioration are not always directly related. In spite of the errors they contain, these inspection figures have been

* See also Calif. Agri. Expt. Stn., Bull. 561.

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used here as an indication of quality, as it is felt that they reasonably reflect the differing rate of deterioration.

The figures demonstrate that a large area extending throughout Essex and East Anglia is the principal area producing high-quality eggs (Fig. 2). Smaller areas of a similar nature appear along the north of the Weald and in Oxfordshire. A belt producing fairly good quality eggs passes north-westwards from these districts to the Midlands. The belt then bifurcates, forming two tracts, one of which extends towards south Lancashire, while the other stretches towards Durham. Isolated areas producing eggs of a similar quality are found in Mid-Devon, parts of Somerset and the lower Severn district.

The greater part of the West appears as a low-quality district, particularly Cornwall, Wiltshire and Dorset, and the south-west of Wales. Further poor-quality tracts may be found in the country lying adjacent to the Humber and Wash, and again to the extreme North-West.

Very little inspection of Fig. 2 is necessary to realize that these isonomical lines show a strong sympathetic variation with both climatic and soil factors. Before proceeding to an attempted investigation of quality from this standpoint, it is reasonable to inquire whether a similar relation exists between egg quality and geographical factors beyond the confines of England and Wales. The purpose of such an inquiry would be to eliminate as far as possible the variations due to differences in handling. Beyond Great Britain, the differences in egg quality are sufficiently great to result in important differences that are recognized on the markets.

It is more difficult to make strong assertions regarding initial quality and rate of deterioration of eggs coming from Europe, since information concerning the period of packing is not always available. Numerous inquiries amongst members of the trade, and many inspections of consignments, have partly obviated this difficulty, and a good deal of information has also been gathered by measuring the percentage of thick white in eggs from these districts. These combined results indicate that the best European eggs are produced near the Russo-Polish frontier, the quality becoming poorer to the north and south. The high-quality district, however, extends in a wedge-like fashion towards the North Sea, and the East Anglian area of England may be considered as an extension of this belt. This distribution

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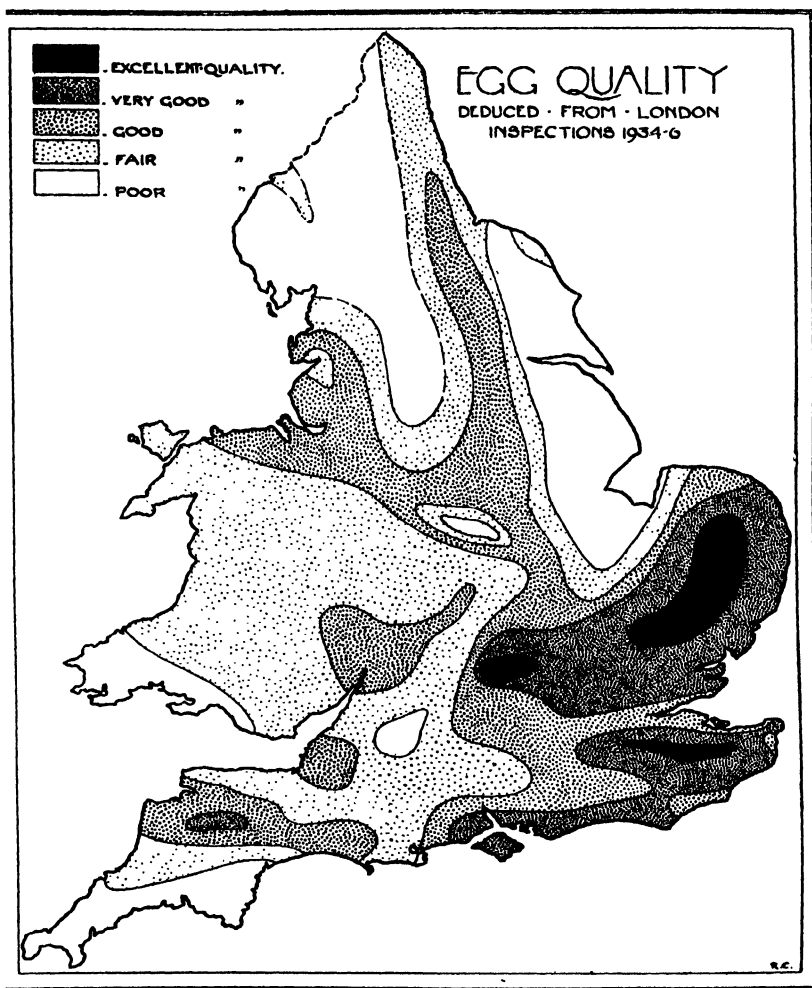


FIG. 2.—Distribution of Egg Quality.

again appears to be concerned with the effect of the soil and climate of the district, and it can be shown that the quality of the eggs coming from more distant parts shows a similar relationship.

It seems possible to identify the geographical factors controlling egg quality, and it is proposed to treat the main climatic and pedological factors in turn. The former will include rainfall, temperature and insolation.

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The isonomical lines noted in Fig. 2 show some relationship with the annual rainfall distribution. It is difficult, however, to see what direct effect such a factor alone can have on egg quality, and beyond the Channel the relationship is still weaker. A more probable factor is to be found in the relative humidity. As it is difficult to obtain sufficient humidity figures for the country the writer has used precipitation-evaporation* figures that can be mathematically calculated and are fairly similar.

The precipitation-evaporation figures for the country have been plotted and are shown in Fig. 3. At first sight there appears to be a strong relationship between the precipitation-evaporation figure and the quality of the eggs produced in the district. The quality of the eggs appears to be inversely related to the precipitation-evaporation figure—or effective precipitation, which may be considered for the present purpose as similar to the relative humidity. Thus where the precipitation-evaporation figure is low, as in East Anglia, the quality index is high. The precipitation-evaporation figures rise towards the west and south-west, and it was noted that the egg quality index showed a marked decline in this direction. A similar relationship can be discerned towards the north and north-west. It may, therefore, be tentatively stated that the better egg quality is associated with low relative humidity. It must, however, be admitted that certain districts do not show this relationship. Lincoln, The Wash and tracts within the Midlands may be named. These exceptions may be ignored whilst an inquiry is made regarding the probable effect of differing humidities on egg quality.

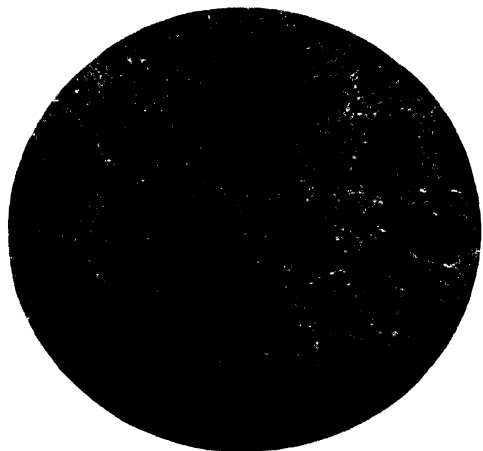
It is suggested that humidity affects the porosity of the shell. It must be assumed at present that in some way the egg is laid with porosity related to the humidity of the area. Presumably this is to control the rate of evaporation from the egg. This may be thought too rash, or too hypothetical, a statement to make, but microscopical examination shows that it is a fact. The shells of several normal eggs from various parts of the country were examined and found to vary considerably as regards number and size of the pores, and more particularly in the compactness of the texture of the shell structure. Two typical examples are shown in Fig. 1.

* See Thorndike, *Geog. Review*, 1931, for formula and nomograph.



EGG SHELL FROM WEST
WALES.

High relative humidity.
Note loose-knit structure.
(Magnified 200 times.)



EGG SHELL FROM MID-
ESSEX.

Low relative humidity.
Note compacted structure.
(Magnified 200 times.)



EGG SHELL FROM EGYPT.
Very low relative humidity.
Note small, very closely-knit
structure.
(Magnified 200 times.)

FIG. 1.—Magnified Egg Shells showing differing Structure.

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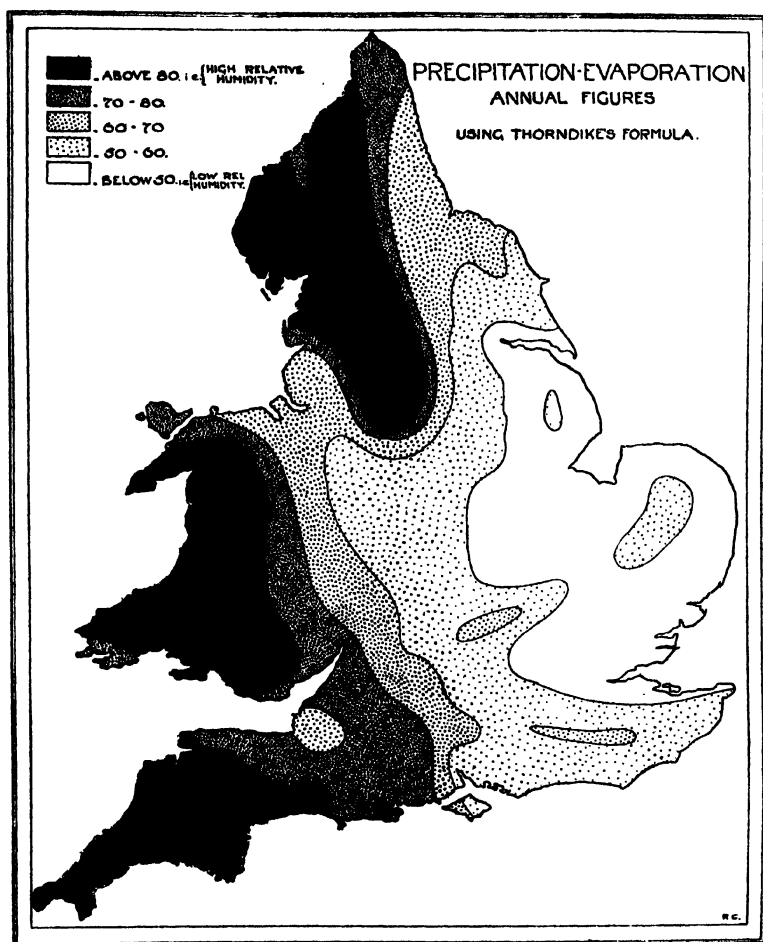


FIG. 3.—Precipitation-evaporation. Annual figures.

Attention should be given to the structure, since the number of the pores is not always an indication of effective porosity. The shell of the egg produced in the more humid west shows a much more open structure than that of an egg from East Anglia, which is a much drier region. Further microscopical examination of foreign eggs showed similar structural characteristics—the lower the relative humidity the lesser the porosity and the closer the crystalline structure.

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The permeability of the membrane should also be considered. Unfortunately the determination of the permeability of a membrane is a longer process than the determination of the porosity of a shell. The microscope does indeed show differences, and membranes vary a good deal in strength over an area. Thickness and strength, however, must not be confused with permeability, and, although one cannot speak with any certainty, it is probable that the membranes show characteristics of a similar nature to those of the shells. No doubt, however, the shell is much the more important in controlling the rate of evaporation.

Microscopical examination was also made of sections of shell from overseas countries—particularly of those lands where the quality of eggs was good. The theory advanced regarding the relationship between porosity and relative humidity appeared to be further confirmed by these inspections, i.e., a low shell porosity and a compact structure are associated with a low relative humidity. The investigation included egg shells from China and Egypt. This apparent confirmation of a theory must, however, be treated with a good deal of caution. It must be borne in mind that only a few dozen shells were inspected—the process is necessarily slow, and any tenable theory must be based on a greater array of fact, and upon inspections carried out at critical periods of the year.

The question now arises as to the manner in which the differing structures affect the rate of egg quality deterioration. For this purpose it is necessary to make a slight digression into the subject of egg constitution. Simply stated, it appears that the break-down of the thick white allows the yolk to pass easily through the white to the shell, and finally to adhere to the shell. It seems, therefore, that the rate of this break-down determines the rate of deterioration. It should also be noted that this break-down process can be largely halted by cold or gas storage. Storage maintains the pH of the egg white at about 8.4 or less—the pH at production is about 7.2. It seems reasonably certain that these storage methods are indebted for their success to the fact that the release of both moisture and gases is slowed down considerably. This process must, therefore, check the break-down of the white. Physical analysis of cold-store eggs shows that this is indeed the case.

The white of egg is formed of compounds of carbon,

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hydrogen, oxygen and nitrogen. The break-down of the thicker part of the white releases carbon dioxide, water and ammonia. These products pass into the thin white forming a "watery white," and a certain amount presumably finds its way into the yolk sac by a process of osmosis, causing it to become flattened and "heated" in appearance. No doubt a large proportion of these gaseous and aqueous products pass through the shell to the atmosphere, thereby progressively increasing the air space. It, therefore, appears obvious that the smaller the degree of porosity and the more compact the shell structure, the slower will be the rate of escape, whilst the decrease in the rate of escape will lessen the speed of the white break-down, and consequently retard the passage of the yolk to the shell. The slow rate of deterioration found in many Asiatic eggs can probably be ascribed to the low degree of porosity and the compact shell structure.

It seems a reasonable argument to urge that, if the shell structure and the degree of porosity are related to the relative humidity, the rate of deterioration in eggs from different districts should be the same if the eggs remain in the district of production and other factors are equal. It is certainly true that Cornish eggs appear much poorer after a few days in London than after a similar number of days in Cornwall, even when transported with care. Further, the Cornish eggs inspected at Birmingham, which more nearly approaches Cornish conditions, rarely appear as unsatisfactory as those inspected at London.

The London district is a region with a low relative humidity. The eggs entering the London warehouses are coming from all sections of the Kingdom—each with its varying relative humidity. One would expect (other factors being equal) the rates of deterioration to be greater in eggs coming from the districts with greater relative humidity. An inspection of Figs. 2 and 3 will show that this does seem largely true. Thus eggs coming from the East Anglian district of low relative humidity enter London with its slightly higher relative humidity and maintain their quality for a longer period than eggs coming from the wetter regions of the west and south-west. This, no doubt, partly explains the traditional superiority claimed for the Norfolk eggs.

Only annual relative humidity has, so far, been taken into account. The consideration of the monthly changes in

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relative humidity bring further points of interest to light. For example, the difference between the relative humidities of the south-west of England, and London and East Anglia in the winter is comparatively slight; in the summer, however, the difference is considerable. The effect of this difference on the quality of eggs coming from East Anglia and Cornwall in winter is small, but in summer the disadvantage lies with the more humid south-western district. The rapid rise in the number of unsatisfactory packs from the south-west inspected at London begins as soon as the relative humidity of London begins to drop. The low relative humidity of London apparently induces a much more rapid evaporation from the egg produced in the humid south-west. It is suggested that the egg shell from the humid district has been produced with a structure only fitted to withstand the evaporation of the area, which is considerably lower than London. The East Anglian egg shell is apparently formed to withstand higher evaporation rates, which are comparable with those of London.

The theory put forward regarding the effect of relative humidity should prove satisfactory when applied to districts beyond the Channel. It was observed that good quality increased along the path of a line stretching from East Anglia through Holland, Mid-Germany and Poland to Roumania and Russia. Here it divided and parts could be found in Egypt, Arabia, Kurdistan and Mongolia.

It should be noted that the quality is again judged in London, and it seems beyond doubt that here is another connexion between relative humidity and egg quality. The average relative humidity of Europe is lowest towards the Russo-Roumanian district—the isonomes showing a wedge-like extension to the north-west. If due consideration is made for the differing ages of the eggs from the various countries, it seems that the better quality eggs are coming from those districts where the relative humidity is low. These conditions appear to explain, in some measure, the fact that most foreign eggs remain in a good state for a longer period than most English eggs.

It must, however, be admitted that the line of high egg-quality passes across Europe in an east to west direction. The low relative humidity isonomes show a tendency to run north-west to south-east. The explanation of this seems to be found in the influence of the soil. Before proceeding to a

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consideration of this factor, however, one more climatic factor remains for investigation.

Insolation, or the amount of sunshine, must be considered apart from any questions of humidity. Sunshine is associated with the synthesis of Vitamin D—the vitamin connected with bone formation and consequently shell. The annual distribution of bright sunshine shows the marked predominance of the south and east, but the relation is not so obvious as with the other climatic factor. It is not improbable, however, that sunshine has some effect on egg-quality. It may be possible to link up sunshine and Vitamin D with shell-hardness, which is becoming an important problem in the Egg Trade. While on the subject of vitamins, it will be of interest to comment on Egg Shell Colour. The brown colour of egg shell is due to the presence of carotin; the deep colour of certain yolks is due to the same cause. The carotin is derived from the yellow pigment of plants, which in turn is associated with Vitamin A. Vitamin A is associated with general health. The strength attributed to the dark-shelled eggs may, therefore, have some basis in fact. The reason, no doubt, is bound up with the question of open range stock, and the effect on shell-quality of soil acting through plant life.

The possible connexion of egg-quality with soil has been raised on several occasions in the previous pages. It is held in the trade that egg-quality is greatly affected by soil conditions, although the reasons put forward are extremely hazy, or usually connected with the plant life of the soils in question. It is possible that the connexion between egg-quality and soil is less obvious than, but probably as important as, climate. It is proposed to attempt to prove that soil affects both the shell and contents of the egg and by this means to put forward reasons for the hitherto unexplained characteristics that were noted in the distribution of egg-quality.

Obviously the effect of climate will be greatest during the summer months. During this period, any control exercised by other regional factors, such as soil difference, will be masked. With this in mind an attempt was made to estimate the importance of other geographical factors, i.e., soil, by carrying out experiments during February, when the effect of temperature and relative humidity—and therefore the effect of shell porosity and structure—would be relatively small. In

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the experiment, a number of new-laid eggs from free-range poultry were physically analysed (in London) and the quantity of inner and outer thin white, the thick white, and the yolk index noted. The eggs were analysed 7 days after production. It will be recalled that a large amount of thick white is commonly associated with good-quality eggs, a small quantity of thick white usually being found with a flattened yolk—and a high pH value. It has been put forward that, with certain climatic conditions, eggs with similar amounts of thick white will show varying rates of breakdown if the shells are different. If the climatic factor be practically eliminated, it seems obvious that differing percentages of thick white associated with different regions must have a further regional cause. The differing thick white contents of the eggs used in the experiment indicate either that the initial amount of thick white differed throughout the districts or the rate of break-down differed, or both. Bearing in mind the climatic conditions, the former is the more probable.

A map based upon the results of the experiment appears in Fig. 4. It is at once apparent that there is a strong sympathetic variation between the thick white percentages and the quality distribution (Fig. 2). The East Anglian and south-east areas again appear as high-quality districts. Other districts of a similar nature are found in Devon, Somerset and Worcestershire—tracts which, it was noted, produced reasonably good-quality eggs although possessed of an unfavourable relative humidity. It will also be observed that Lincoln, Wiltshire and Dorset appear with low percentages of thick white. These were regions in which poor-quality eggs were found although the relative humidity was favourable. In general, it may be said that lower percentages of thick white (accompanied by low-yolk indices) are found to the west and south-west.

An inspection of this distribution of the thick white percentages suggests that here is a clear case of soil influence. A generalized map of soil types appears in Fig. 5 and a good many correlations are apparent. The low-white percentages and low-yolk indices (or poor-quality eggs) of the west are associated with the generally infertile old rock soil. The best-quality eggs are found in the south-east of England where loams and light fertile clays are dominant. Eggs of medium quality are associated with the chalky districts and the heavy clay lands—the former usually having the poorer quality eggs.

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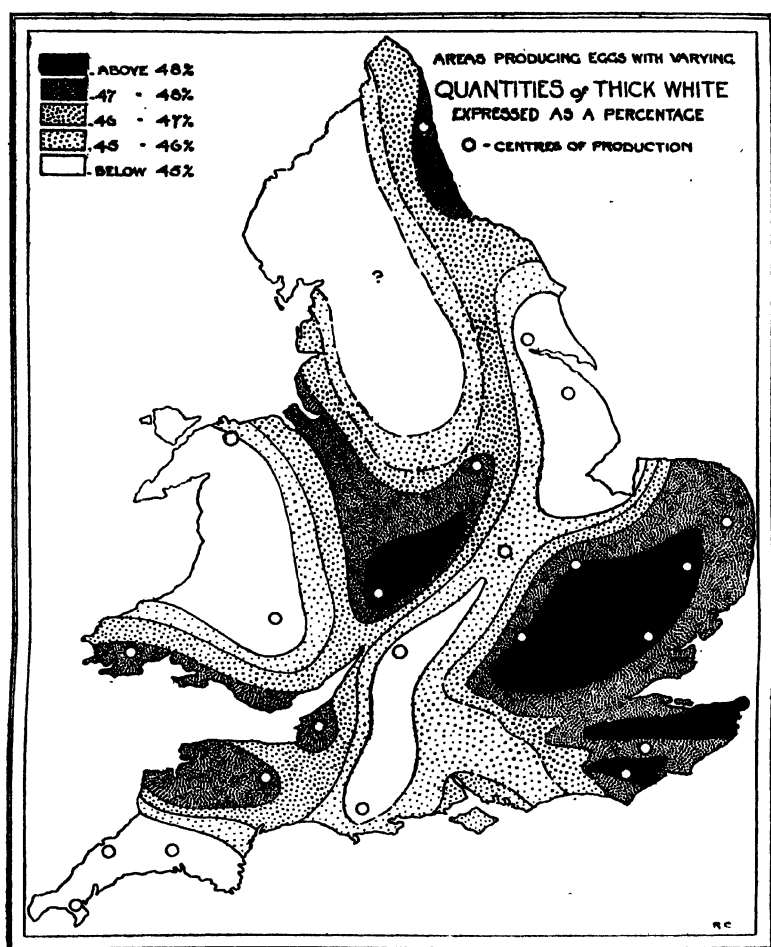


FIG. 4.—Areas producing eggs with varying quantities of thick white.

A study of the four maps shows that certain regions have both climate and soil in their favour, others have the reverse, whilst some districts have one or other in their favour. The south-east of England is a district having both factors favourable, whilst the west shows the opposite case. The east coast presents an interesting example of the effect of one or both favourable factors. It may be recalled that poor-quality eggs were found in Lincolnshire and good-quality

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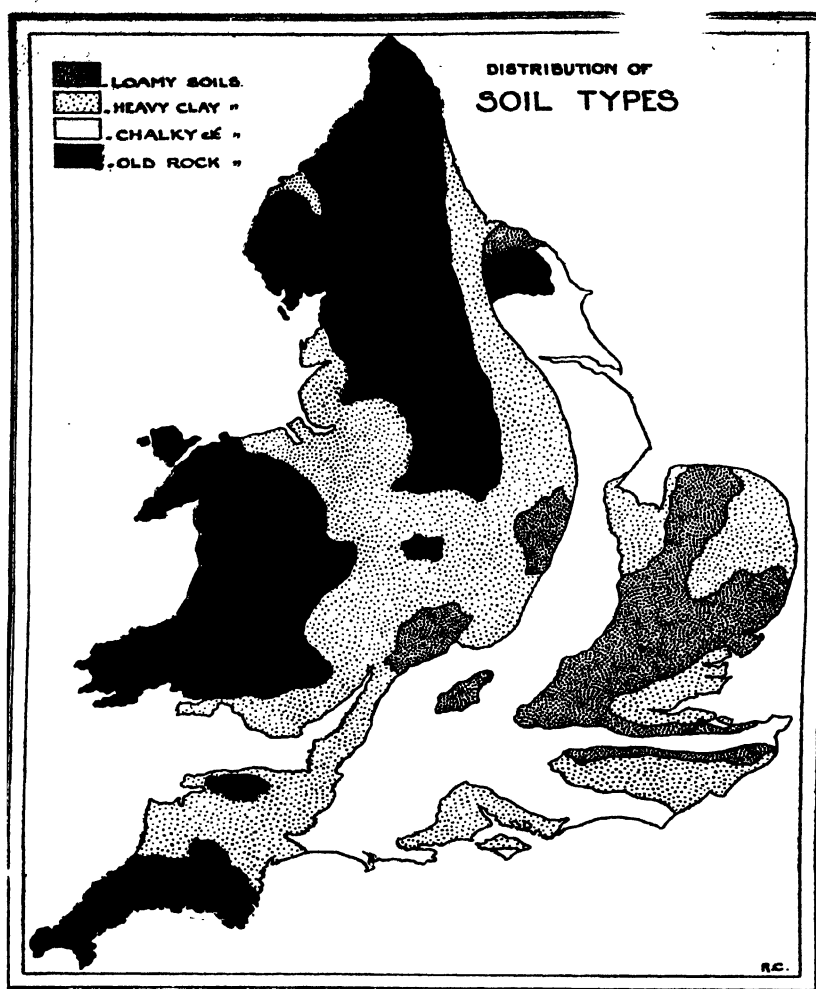


FIG. 5.—Distribution of Soil types.

eggs in East Anglia. It may also be recalled that the relative humidity showed little significant change throughout the tract stretching from Suffolk to the Humber, but the egg quality shows a decided change to poor-quality as Lincolnshire is reached. In the absence of other information relating to the subject, one must assume that soil differences are responsible for the varying quality. It will be noted that the Wash area,

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and (particularly) Lincoln are tracts where fertile loams are not so plentiful as in East Anglia.

A digression might here be made on the subject of breed and rearing. It is commonly stated that the cause of poor-quality eggs in parts of Huntingdon is due to the presence of many poultry farms—the heavy laying strain weakening the egg-quality. While not denying the possible truth of this statement, it is urged that the soil factor is equally, or more, important. In support of this, it will be noted that Mid-Essex, which is a district of many poultry farms, is conspicuous by its high egg-quality. The soil type of this district is similar to that of East Anglia. Further, the figures of thick white were obtained from free-range poultry, and it will be noted that the quality of the Lincoln-Wash area still remains inferior to that of East Anglia (Fig. 4).

The question now arises as to the manner in which soil can affect egg-quality. It may affect egg shell or egg contents, and the following suggestions have been put forward, although it must be admitted that the cause is still undetermined. A study of the soil map suggested that the shell might be affected by the variation in the silica content. Analyses of good-quality egg shells from the loamy districts did indeed show small traces of silica, which was apparently present as calcium silicate. The presence of this substance would render the shell less permeable (not less porous) to gases and vapours. Thus a shell with a high percentage of calcium silicate (reasonably evenly distributed) would lessen the evaporation in even a thin-shelled egg, while a shell deficient in this material would show greater permeability although the shell might be considerably thicker. It is probable that a comparatively high concentration of calcium silicate will be associated with areas of sandy soils. In districts of this nature the shells will doubtless be rather thin when compared with a chalky area, where thick, but permeable, shells would probably occur. This suggestion gains a little support from the fact that many farmers find that feeding kale (containing a high percentage of silica) improves both shell and the keeping quality of the eggs. Nevertheless, the suggestion is still in the theoretical stage and must await the results of many more analyses, which are necessarily slowly accumulated.

The soil type may also affect the contents of the shell. It appears from the inspection of soil pH figures that slight

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acidity of soil is associated with areas of good-quality eggs. It is quite possible that this is mere chance. There is hardly any direct relation between high-quality eggs (i.e. eggs in which the white slowly breaks down, therefore, making the pH increase rate slow, apparently owing to the escape of CO_2) and the low pH of the soil which may be due to the presence of CO_2 or other reasons. An attempt will be made, however, to show that there are possible links between the pH of the soil and egg-quality. It is being assumed that in eggs of good quality either (i) the initial amount of thick white is large, or (ii) the rate of breakdown of the thick white is slow because of some constitutional difference. In these two cases, the rate of the increase in the pH value will be slow.

The first link between egg quality and the pH of the soil may be found in the egg yolk. One of the constituents of egg yolk is Cholesterin ($\text{C}_{27}^{\text{H}} \text{H}_{44} \text{O}$). There is a connexion between Cholesterol ($\text{C}_{27} \text{H}_{45} \text{OH}$) and Vitamin D. Higher animals manufacture their own cholesterol to be used for Vitamin D; the connexion between Vitamin D and shell has already been noted. The manufacture of sex hormones is intimately bound up with cholesterol—the compound forming the basis of them.* To return to the question of the pH of the soil, it will be found that the pH is slightly low where animal refuse is plentiful. Animal manure contains a certain amount of the sex hormones. There is reason to believe that sex hormones are necessary for normal plant growth; the relation between the sex hormones and cholesterol has already been noted. It is possible, therefore, that the pH of the soil, roughly indicating the amount of humus and so animal refuse (?), may be an indication of the prevalence of sex hormones. These, if picked up by the scratching fowl, may affect the cholesterin content of the egg and possibly the Vitamin D content and so the shell. There seems to be no record of the cholesterin content variation of eggs from different districts, but the following figures of soil pH values and yolk indices of various stations make interesting comparisons.

<i>District</i>			<i>pH of soil</i>	<i>Yolk Index</i>
Suffolk ..	..	..	6	0·500
Norfolk ..	..	..	6	0·494
Oxford ..	..	..	6	0·462
Huntingdon ..	..	..	8	0·414
Brecon	8	0·440
Wiltshire	7·6	0·439

* See also Furnas, 1936, *The Next Hundred Years*.

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On the other hand, it is possible that the pH of the soil may affect enzyme action. This seems quite a reasonable conjecture and suggests a fruitful field for research.

The suggestion made above regarding humus is probably worthy of a little more explanation. An inspection of the pH figures indicates that, in general, a slightly low pH is associated with a thick covering of humus. This is, of course, to be expected. The humus covering will be rich in nitrogen. It is possible that this nitrogen may be assimilated directly, or indirectly by means of plant food, by the chicken and so strengthen the white. In this connexion, it is interesting to note that thick whites are associated with regions of thick humus, as in China. It is none the less interesting to recall the fact that the Chinese soil is heavily charged with animal refuse, and that one would reasonably expect to find the soil also containing a high percentage of sex hormones, which may affect the cholesterin content and so Vitamin D and shell (?).

It would normally be expected that chalky areas would give the best-quality eggs, and particularly egg shell. Such is not the case. Chalky areas appear on the quality map (Fig. 2) as average to poor districts. The thick white of newly-laid chalk-land eggs is not distinguishable by its quality. It is suggested that this low-grade quality is due either to rapid evaporation through the permeable shell, or to the effect of several factors connected with the humus and pH value.

Beyond the Channel, the soil also appears to affect egg-quality. It has already been observed that the influence of climate appears partly to control the quality of eggs produced on the Continent. The question of Continental soil distribution is too large to permit of its discussion in the scope of this article. It need only be said that a belt of glacial soil that eventually becomes the chernozoom in the east is the soil in Europe that is analogous to the East Anglian loam. No doubt the influence of this belt can be seen in the manner in which the line of increasing quality falls to the north of the line of increasing relative humidity.

An attempt has been made to show that the quality of eggs varies throughout different regions. Suggestions have been made that the cause of this variation in quality is to be found in the differing climates and soils. As regards the former factor, a certain number of facts have been presented, but in the case of soil the position is not so happy. That there is

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some connexion is apparent, and suggestions have been made that are still largely theoretical. It is hoped, however, to progress with the investigation, since the information gathered from such work would show whether the condition of affairs in a certain district was satisfactory or not, and could suggest areas where quality would remain satisfactory for a much longer period, thus placing home-produced eggs on a stronger competitive basis with foreign packs.

ONION GROWING IN ENGLAND: A NEW COMMERCIAL METHOD

A. H. HOARE,

Ministry of Agriculture and Fisheries.

ONE of the most striking features of English commercial horticulture is the small acreage of land annually devoted to the production of ripe onions. This feature is all the more remarkable when viewed in the light of the home consumption of this vegetable. It is clear that the population of the British Isles relies mostly on imports for a supply of onions, and that a large sum is annually sent abroad to pay for a commodity that might be produced at home. This position of affairs cannot be regarded as satisfactory.

Information bearing on the supply and consumption of ripe onions in England and Wales is provided in the Ministry's Bulletin.* In the year 1932, as an example, the area of land devoted to the cultivation of onions, as returned on June 4, 1932, was 1,892 acres, principally distributed throughout the counties of Bedfordshire (357 acres), Kent (202 acres), Essex (184 acres), Middlesex and London (126 acres) and Worcestershire (116 acres).

Of this acreage, however, only 924 acres were estimated to have been devoted to the production of ripe onions, the total production being reckoned at 5,400 tons, or 5·84 tons per acre.

In the same year, the imports of onions attained the remarkable figure of 9,995,000 bus. It is noteworthy that the imports of ripe onions rose steadily over a period of ten years, from 7,980,144 bus. in 1920 to 10,171,000 bus. in 1931. On the other hand, the home production had declined from 3,966 acres in 1913 to 1,534 acres in 1931, since when the figures have risen again slightly as follows: 1932—1,892 acres; 1933—1,941 acres; 1934—2,099 acres; 1935—1,704 acres.

Further information, which throws light on the amount of money involved in buying onions from abroad, is contained in the recently published report on Vegetable Marketing in

* Bull. No. 69. *Onions and Related Crops*. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1s., post free, 1s. 2d.

ONION GROWING: A NEW COMMERCIAL METHOD

England and Wales.* On the subject of imports, the report gives information to the effect that during the year 1933 a total quantity of 10,205,036 bus. of onions, valued at £1,239,844, was imported. After allowing for re-exports, the onions actually consumed amounted to 9,936,777 bus. valued at £1,198,111. On the subject of home production, the report states that the estimated average annual acreage of land devoted to the production of ripe onions during the 1930-32 period was 1,100 acres, producing a yield of 7,600 tons valued at £43,000. Actually, the home onion-crop occupied only the 15th place amongst home-produced vegetable crops based on acreage, and 13th place based on tonnage of production.

From the above brief survey of the position, it is evident that the consumption of ripe onions in Great Britain, taking both imported and home-grown supplies, must be in the neighbourhood of 10,000,000 bus. annually. It must be a disturbing thought to all who have the interests of British commercial horticulture at heart to reflect that the bulk of this vast consumption is being supplied by imports from foreign countries—mainly Holland, Spain and Egypt. In this connexion, it is worth noting that the Dominions and Colonies of the British Empire send very few onions to Britain.

What then is the reason for this position of affairs? Why is the home grower of vegetables so reluctant to extend his production of onions? What are the reasons that can be advanced to explain this persistently restricted production? The following reasons may be suggested:—

1. The lack of suitable varieties. It is said that the public prefer a large, mild-flavoured onion of the Giant Spanish type.
2. The unreliable nature of the English climate. Dry and sunny weather is indispensable for a proper harvesting of the crop.
3. The average yield per acre is too low to render the crop an economic proposition.
4. Low market prices as a result of foreign competition.

Careful inquiries made by the writer failed to disclose sufficient evidence to support the theory that, other things being equal, the British consumer favoured the imported types of onion. It appeared to be true, on the other hand, that the

* Marketing Report No. 25. *Marketing of Vegetables*. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1s., post free, 1s. 4d.

ONION GROWING: A NEW COMMERCIAL METHOD

public preferred a solid onion with a "bite" for all cooking purposes. Only those who were in the habit of eating raw onions appeared to prefer the mild types such as the Spanish, but these people are in a decided minority. The conclusion was drawn, therefore, that amongst the large range of varieties of onions grown in England there could be found examples which met the requirements of the market as regards quality, flavour and general appearance.*

A good deal of evidence, however, was encountered to support the reasons suggested in 2 and 3. The English climate was definitely looked upon as unreliable for onion harvesting. Normally the spring-sown onion crop is not ready for harvesting until mid-September, by which time there is not infrequently a definite break in the weather, and in consequence onions are not harvested in good condition and fail to keep. It should be unnecessary to remind readers that the production of good, saleable onions depends to a very great extent on successful harvesting.

The third reason put forward, that of low yields, turned out, however, to be the principal one. All available evidence pointed to the fact that the average yield per acre of onions grown in the normal way was low, too low in fact to render the crop attractive to growers. Here again climatic conditions appeared to play a part. In order to make certain of securing the best possible weather conditions for harvesting, onions are usually grown on dry land and under conditions of low rainfall. Such conditions may be found in Kent, Bedfordshire and East Anglia, and it is in these districts that onions are mostly grown.

On the other hand, these districts are subject to early summer droughts, often of outstanding severity, and the effect of such droughts is fatal to the spring-sown onion crop so far as weight of crop and size of bulb are concerned. As an example of the effect of summer drought, it is worth noting that the average yield of onion crops in the Biggleswade district of Bedfordshire for the year 1935—a drought year—was only 4 tons per acre, and the onions were unusually small.

In short, although crops of up to 9 or even 10 tons per acre

* Nevertheless, it is understood that retailer members of the Horticultural Advisory Council are emphatically of opinion that a mild onion is needed; and the braised onion of restaurants is usually of the Spanish variety.

ONION GROWING: A NEW COMMERCIAL METHOD

are spoken of and regarded as good crops, it is probable that the average crop over a period of years would lie between 4 and 7 tons per acre.

Another difficulty, attendant on drought conditions, arises from the fact that crops grown under such conditions contain a high percentage of small-sized onions (picklers), which are not so saleable as the large-sized and better looking onions.

It was evident, therefore, that more often than not the yield of home-grown onions was too low, uneconomic, and often failed to cover the cost of production.

As regards prices, information given in the report on vegetable marketing, referred to above, showed that the seasonal average prices (wholesaler to retailer) of British onions (second quality only) at certain large town markets in England and Wales for the period 1925-1934 were as follows:—

1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
s. d. 8 11	s. d. 7 2	s. d. 7 7	s. d. 10 0	s. d. 8 7	s. d. 4 11	s. d. 6 3	s. d. 10 9	s. d. 6 6	s. d. 5 11

Average price for 10-year period = 7s. 7·9d. per cwt.

It was clear from the above considerations, therefore, that some other system of production must be sought in order (a) to raise the yield per acre, and (b) to ensure that a properly harvested crop was obtained. Reflection on these two points led to doubt being cast on the system of raising crops of onions from spring-sown seed.

In the experience of the writer, the practice of sowing onion seed in early autumn and transplanting the young plants in the early spring of the following year had never failed to provide a crop of large, well-ripened onions of good edible quality. The usual argument that this practice produced a large number of "bolted" plants, i.e., plants which ran up to seed, was found to have no foundation in fact, provided a suitable variety was chosen and certain details of cultivation were observed.

It had always been obvious that, by starting with plants instead of seed in the spring, a distinct advantage was secured. The plants grew away rapidly and were able to make full use of the stored-up moisture of the soil, whereas seed germinated slowly and the seedlings were apt to suffer from lack of moisture if the weather turned dry. Again, it had

ONION GROWING: A NEW COMMERCIAL METHOD

been observed that the onions grown from plants were well-developed and ready for harvesting by mid-August, normally 3 or 4 weeks before the spring-sown crop. Thus better weather conditions were available for proper harvesting. Not only were the onions larger, but it had been found that they kept better than those grown from spring-sown seed.

The variety of onion that had given such excellent results under garden conditions was *Unwin's Reliance*. This onion, which is of the white Spanish type, produces bulbs of good shape and depth, is golden brown in colour, solid, medium flavoured and an excellent keeper. Unlike the Giant Zittau, a type to which it bears some resemblance, Reliance displays very little tendency to bolt and can mature a crop of good-sized bulbs even under conditions of severe drought. This onion has been known in parts of Cambridgeshire and Suffolk for upwards of 50 years, is freely grown in cottage gardens and on allotments, and has never been known to fail. Messrs. W. J. Unwin, Ltd., seedsmen, of Histon, Cambs, acquired a stock of this onion about 20 years ago, and introduced it to the general public under the name of Reliance. It is practically a pure line variety and exhibits very little variation.

A Test on a Commercial Scale. As no instances of this onion being cultivated on a commercial scale could be discovered, it was resolved to carry out a careful test of its suitability by cropping an acre of land during the 1935 season. Messrs. W. J. Unwin, Ltd., kindly undertook to provide the land, labour, seeds and manures, and the writer assumed responsibility for the test.

Under this system of onion production, the operations are divided into two parts—namely, raising the plants and growing the crop. The entire field of operations was spread over a period of roughly 12 months.

1. *Raising the Plants.* The seed was sown on a piece of land, roughly $\frac{1}{4}$ acre in area, during the third week of August, 1934. The soil was a medium loam over clay. This land was part of a larger piece that had carried a crop of green peas and was cleared by the end of July. After the peas, the land was skimmed and harrowed down. The onion seed was drilled with a small hand drill one row at a time, the rows being 18 in. apart. It had been estimated that approximately 40,000 plants would be required to plant an acre of land, and to make certain of this supply it was decided to

ONION GROWING: A NEW COMMERCIAL METHOD

sow 3 lb. of seed. The seed came up well, and owing to the mildness of the autumn and winter the plants became very large and strong by the end of February. The seed bed was hand-hoed twice and the rows of seedlings hand-weeded once. The raising of the plants was a complete success, the one doubtful point being that the plants were considered to be too large. In this connexion it should be mentioned that small plants are considered to give the best results, and in any case they should not be thicker than a lead pencil.

2. *Growing the Crop.* A piece of land, exactly 1 acre, and consisting of the same type of soil throughout, was selected for growing the crop. The soil was a medium loam of good depth over a clay sub-soil. The land had been used for growing a crop of gladioli corms in 1934, and had received for that crop a moderate dressing of 8 loads of farmyard manure per acre. In December, 1934, it was well ploughed, and left until the following month of March. In the first week of March, the land was harrowed down ready for planting.

Planting commenced on March 6, 1935, and went on for 4 days until completed. Planting was done by hand, the men using dibbers for the work. The plants were lifted with a fork, shaken out and conveyed to the planters in shallow boxes. Although the nights were frosty the plants did not appear to be affected. Instructions were given to the men to make the plants very firm as a safeguard against frost lifting; and they were put out in rows 18 in. apart with a space of 9 in. from plant to plant.

At the end of March, when the plants had become well established and were commencing to grow away, the land was given an application of 8 cwt. of a compound fertilizer, the analysis of which was considered to be well balanced for a crop of onions and was as follows:—

4.94	per cent.	Nitrogen.
7.3	„ „	Phosphoric acid soluble in water.
1.24	„ „	„ „ insoluble in water.
6.0	„ „	Potash.

25 per cent., by weight, of this fertilizer consisted of finely-ground Peruvian guano.

The fertilizer was broadcast and hoed in by hand, and in a short space of time produced a very marked effect on the plants. There is no doubt that this fertilizer treatment played an important part in the subsequent success of the crop and indicates that a complete fertilizer, approximating to the 1-2-1 or 1-2-1½ analysis ratio, is useful for onions.

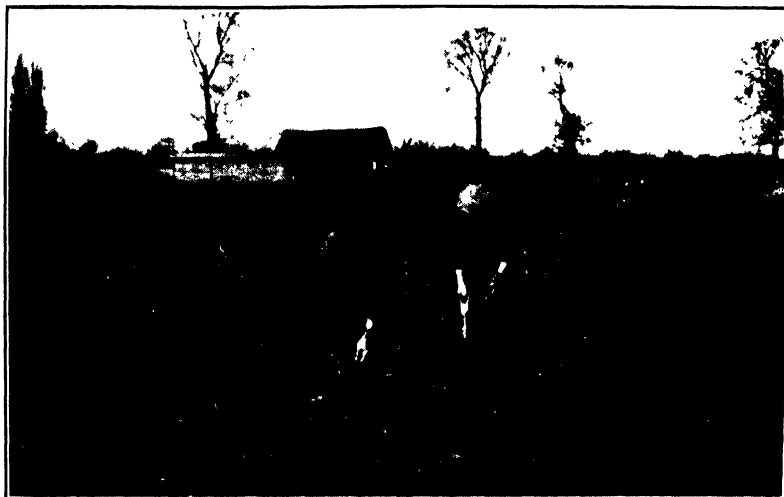


FIG. 1. --Planting the crop, March 8, 1935 General view of the field showing the men at work.



Photos: School of Agriculture, Cambridge.

FIG. 2---Planting the crop. Near view, showing details of the method used.



FIG. 3.—Harvesting the crop, August 21, 1935.

Photo: School of Agriculture, Cambridge.

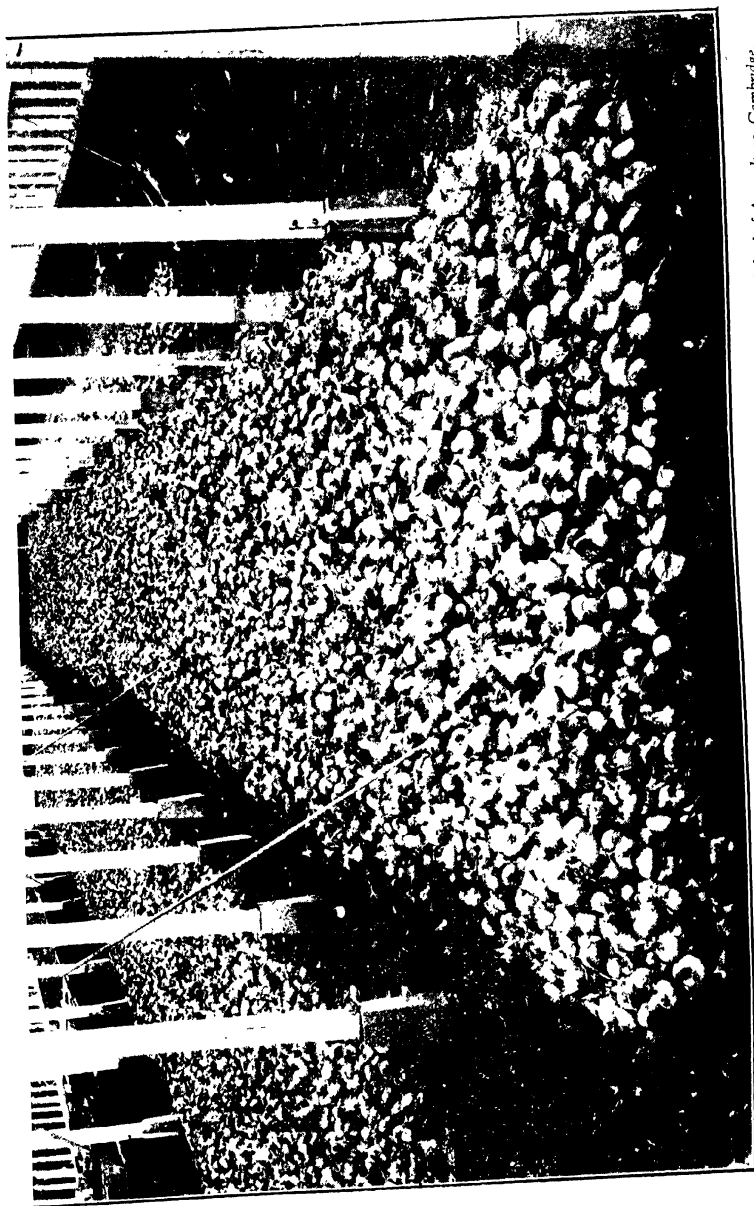


Photo : School of Agriculture, Cambridge.
Note size and quality of the bulbs.

FIG. 4.—A photo of part of the crop taken on September 6, 1933.

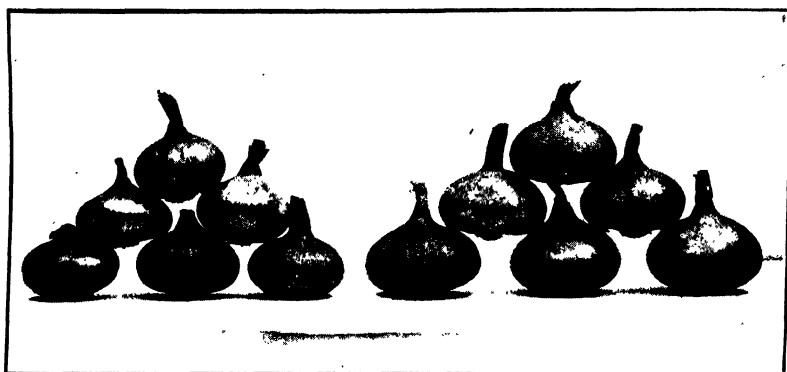
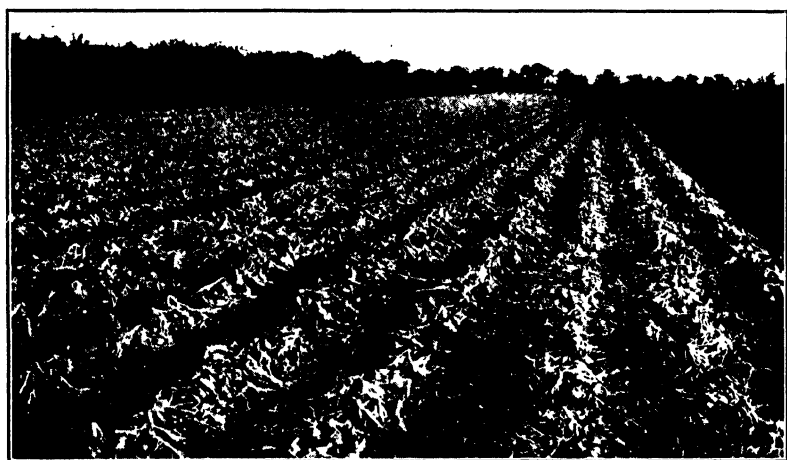


FIG. 5.—Onion : Unwin's Reliance.

Left : Diam. $3\frac{1}{2}$ in.
Weight $8\frac{1}{4}$ oz.

Right : Diam. $3\frac{3}{4}$ in.
Weight $9\frac{1}{4}$ oz.



Photos : School of Agriculture, Cambridge.

FIG. 6.—Another view of the crop after harvesting, August 24, 1935. Showing rows of onions laid out to dry.

ONION GROWING: A NEW COMMERCIAL METHOD

The crop was hand-hoed three times, strict instructions being given to the men to use care and avoid bruising the plants and nicking the stems with the hoes.

Apart from a few brief showers very little rain fell on the crop, but in spite of this the onions developed well and showed no distress due to lack of moisture. Approximately 2 per cent. of the plants commenced to bolt and were pulled out. The plants were commencing to die down by the middle of August, and in the third week of August it was decided to harvest the crop.

Harvesting consisted of pulling the onions, and throwing 2 rows together so that the bulbs lay on firm soil between the rows. The onions lay on the land for 14 days, after which they were picked up and carted to an empty tomato glass-house to complete the drying-off process. After harvesting onions it is very important to keep them as dry and cool as possible, and in handling the bulbs care must be used to guard against bruising. In the absence of such conditions, and if the onions are bruised in handling, the tissues are soon attacked by the spores of *Botrytis Allii*, this fungus causing considerable damage amongst stored onions in Britain.

As the crop was gathered up and removed from the field it was carefully weighed. The total weight of good onions grown on the acre of land was 11 tons 14 cwt. A detailed examination of the crop was next carried out, and the following data bearing on the size and weight of the bulbs were obtained:—

per cent	diameter	weight
42	3½ in.	8½ oz.
42	3¼ „	9½ „
8	4 „	9½ „

The cost of producing this crop of onions and getting it ready for market was as follows:—

TABLE 1. RAISING THE PLANTS.

					£	s.	d.
Land charge	..	..	..	..		5	0
Preparation of seed bed	..	..	..	..		2	6
Seed and drilling	..	..	..	..	2	10	0
Cleaning	..	..	..	..	3	10	0
TOTAL	..	..	..	..	£6	7	6

ONION GROWING: A NEW COMMERCIAL METHOD

TABLE 2. GROWING THE CROP.

	£	s.	d.
Land charge	1	10	0
Ploughing and cultivating	1	0	0
Lifting the plants and planting	6	8	0
Fertilizer and application	6	3	6
Cleaning, <i>i.e.</i> , hoeing, etc.	4	15	0
Harvesting, <i>i.e.</i> , pulling, picking up, and carting to sheds	4	5	0
TOTAL	£24	1	6

Total cost of the crop = £30 9 6

The value of the crop at the completion of harvest was 6s. 6d. per cwt., a low figure, hence the gross value of the onions grown, as at harvest, was £76 11s. 0d. From this amount the sum of £4 17s. 0d. representing the cost of cleaning off, bagging and the cost of the onion bags, must be deducted.

Final figures are therefore arrived at as follows:—

	£	s.	d.
Cost of production	30	9	0
Cost of preparation for market	4	17	0
TOTAL COSTS	£35	6	0
Total value of crop grown	76	11	0
Less production, etc., costs	35	6	0
BALANCE	£41	5	0

The crop of onions grown in this trial met with a ready local sale. In order, however, to test the value of the onions on the London market, a consignment was dispatched to a salesman in Covent Garden Market on December 17, 1935. This consignment met with a ready sale at a price of 7s. 7d. per cwt., and the quality of the onions was favourably reported on by the salesman, who asked for further supplies.

Summary. 1. In order to test the commercial value, an acre of onions was grown from plants instead of seed. The system of cultivation followed is described in detail.

2. A variety of onion known as Unwin's Reliance was found to be eminently suited to this system of cultivation, and produced onions of satisfactory shape, size and flavour.

3. In a dry season, which must be regarded as abnormal and also adverse to the onion crop, a yield of 11 tons 14 cwt. was obtained from an acre of land.

4. Figures are given showing that onions can be produced on a profitable basis in Great Britain.

AN INEXPENSIVE COWSHED

A. O. SMEETON, B.Sc.

At the present time, great interest is being taken in the improvement of our milk supply. Unfortunately, this work is hampered in many cases by buildings that do not in any way meet modern requirements. To replace these by modern cowsheds, constructed of bricks or concrete, would involve owners of land in a heavy outlay that they might be unable to meet. Moreover, in view of the rapid changes that take place in ideas on the housing of live stock, there appears to be quite a possibility that a substantial brick or concrete cowshed erected to-day according to the most modern ideas, will be obsolete in fifty years' time. For this reason, it is perhaps desirable, from the point of view of a large section of the farming community, to erect cowsheds which, while thoroughly up-to-date as regards sanitation and the production of clean milk, are partly constructed of less expensive, even if rather less durable materials than brick, stone or concrete. Wood, unless varnished, is viewed with disfavour, as it cannot very well be washed down. Galvanized iron is held by some to be cold. In the cowshed here described, however, it was found wholly suitable for the walls from a height of 2 ft. above the ground; and, in the very cold weather before Christmas, 1935, the building was found to be very warm and comfortable. Asbestos sheeting seems a very suitable material for the roof. It is warm in winter and not very hot in summer—moreover, it is not subject to condensation to the same extent as is galvanized iron.

The cowshed described below, designed to house 12 cows, was erected on a small holding belonging to Mrs. C. Smeeton, of Whitney House, Bunny, Notts. Rough plans prepared, were accepted by the Local Authority, no professional assistance being employed. Secondhand wood was purchased for the framework. This was prepared and erected by a joiner, with one assistant who had a little knowledge of carpentry. Secondhand 2-in. iron water-piping was purchased to form the division between the cow standings, and was bent to appropriate shape by a local blacksmith. The

AN INEXPENSIVE COWSHED

concrete floor and walls 2 ft. high were erected by a builder, although this work could easily have been carried out by farm men under supervision, had they been available. Drainage was by 6 in. pipes to a main drain 40 yds. away.

Method of Erection. The wooden framework of the cowshed was erected first, the asbestos roof, gable ends and galvanized iron sides being fitted afterwards, leaving a 2 ft. space below the sides for the concrete walls. This system of erection might be called the "Dutch Barn" method, since the foundations and floor were put in after the framework had been put up.

In constructing the framework of the building, the first work to be done was the making of five identical sections each 16 ft. wide, the external width of the cowshed..

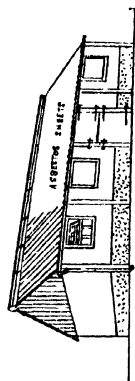
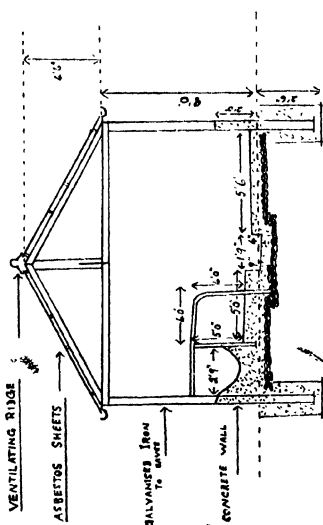
When one of the sections (see drawing) had been made, it was a simple matter to build the other four, using the first one as a pattern. A suitable piece of 3 in. \times 7 in. timber was selected and sawn off to a length of 16 ft. This was placed on the ground while 10 ft. 6 in. uprights were fitted at right angles (using a large set-square) by halving uprights and crosspiece to make joints, which were secured by two $\frac{3}{8}$ in. bolts at each end. A 16 ft. length of boarding was then temporarily nailed across the section, 4 ft. below the crosspiece, to keep the frame more rigid, this temporary stiffener being used later for levelling the sections as they were being erected.

The gable part of the section was then sawn and fitted, making the point of the gable 4 ft. 6 in. above the crosspiece, the truss being strengthened with a wrought iron U-shape strap round the crosspiece at the centre, 8 in. nails being used, holes for these being first bored with a brace and bit.

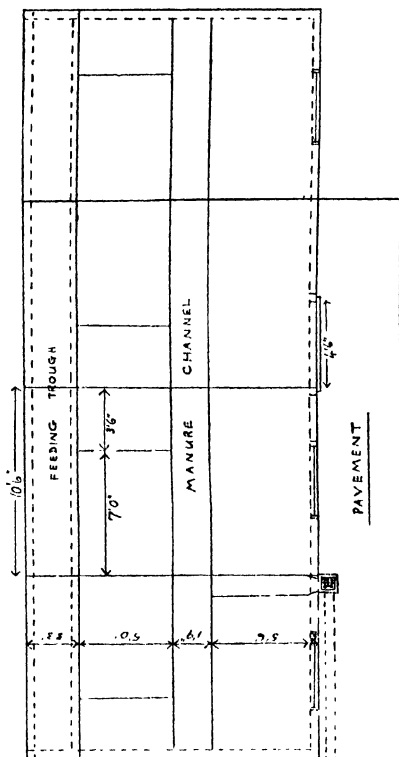
Erection of Sections. When the five sections were completed they were set up on the site chosen for the building. Holes were dug, about 2 ft. 6 in. deep and 16 ft. apart, to take the first section, the depth of the holes allowing roughly a height of 8 ft. to the eaves above the ground. Two bricks were laid side by side in the bottom of each hole to give a firm support to the section. Adjustments were then made until the first section was correct, using a spirit-level and the section temporarily supported by nailing on four lean-to props to prevent any movement while the other sections were being fixed.

AN INEXPENSIVE COWSHED

SECTION THROUGH HOUSE



GENERAL VIEW



PLAN OF COWSHED

AN INEXPENSIVE COWSHED

The rest of the plan was measured and pegged out on the ground, allowing 10 ft. 6 in. between each section, centre to centre. Great care had to be taken that all sections were on the same level, independent of the slope of the ground, also that they were "in line," the same distance apart (10 ft. 6 in.) and perfectly upright. It was easily found which of two sections was at a lower level by resting a bar from one to the other on the temporary stiffeners (mentioned in making the section) and testing with a spirit level.

Alternate layers of broken bricks and fairly liquid cement and sand mixture were rammed into the holes to make a concrete support for the sections.

When the concrete had thoroughly hardened, the temporary supports were removed and the remainder of the skeleton framework completed. Wall plates were fitted along the whole length of the building, these connecting the sections together. Another upright was fitted 4 ft. from one of the sections to make the doorway. Wall plates were also fixed all round the building 4 ft. below the eaves, the three windows resting on and bolted to these, and the sides and ends further strengthened by triangulating. The galvanized iron sheets were not fitted on the sides until the roof had been finished. This was done so that no space was left below the eaves—the galvanized sheets being pushed well up to the asbestos sheets of the roof before being nailed.

Roof. For the roof, sheets of asbestos were used, these being nailed on to 4 in. \times 2 in. purlins. Two 5 ft. sheets were found to be just long enough for the slope of this particular roof, after allowing for overlapping and space for ridge ventilation (3 in.). Four sets of purlins formed the support for the roof and these had to be spaced so that the sheets overlapped between the two middle ones. Holes were bored with a brace and bit and 7 in. nails used to fix the purlins on to the trusses. The corrugated asbestos proved quite as easy a material to work with as galvanized iron, provided it was used gently, and little difficulty was experienced with it. The roof was completed by fitting special asbestos ridge tiles.

In making the gable ends of the shed, after the 6 ft. galvanized iron sheets had been fitted, it was found that the asbestos sheets could be sawn to whatever shape was required and this also proved very useful in giving a good finish to the work.

AN INEXPENSIVE COWSHED

The building was now completed except for the concrete walls, floor and internal fittings. Most of this work was done by a builder, owing to shortage of time, but many farmers might prefer to do it themselves.

The concrete walls were built first, the floor, etc., being put in afterwards. Shuttering for these was formed by planks nailed horizontally and close together on the outside and inside of the building between two of the sections. Concrete, composed of cement, sand and broken bricks thoroughly mixed, and in fairly liquid condition, was filled in between the shuttering. When the concrete had set, the boards were removed, the wall surface being neatly faced-up with cement.

One of the greatest savings in cost was effected in the fittings of the cowshed, which, in the ordinary way, are a considerable item. 100 ft. of 2-in.-bore secondhand iron water-piping was bought at a cost of 10s. This was then made up by a local blacksmith into five large divisions, as the cowshed was designed to hold 12 cows. The front ends of the divisions were bolted on to the framework of the building. Iron sheets were then fixed on to the top rails of the tubular framework of the divisions, the sheets being bent round the rail and secured by small nuts and bolts. The iron sheets were left hanging freely, the lower ends being embedded in the concrete when the floor and feeding troughs were put in later. Tying chains were fitted to slide on the two metal uprights on the front of the feeding troughs.

It will be seen from the plans that the divisions are best made comparatively large, namely, 5 ft. high at the front, falling to 4 ft. high towards the channel, and extending backwards to 1 ft. from the channel. This design has proved to be very satisfactory, as there is no possibility of one cow interfering with a cow on the other side of the division, a trouble experienced with some of the lower types of divisions. Small concrete semi-divisions may separate one trough from the next. High divisions between the troughs prevent the cows robbing each other, but if the division is too high, a bundle of hay placed between the two cows is apt to fall entirely into one cow's trough. If, however, each cow is rationed separately for hay, according to modern methods of feeding, a high division is an advantage. The fittings mentioned included 12 chains; and the cost of making the divisions, etc., worked out at less than one-third the cost of new manufactured fittings of a similar design.

AN INEXPENSIVE COWSHED

The cost of the cowshed, 42 ft. × 16 ft., for the 12 cows, worked out as follows:—

Framework :	£	s.	d.
Wooden framework (second-hand wood)	8	0	0
Ironwork, bolts, nails, etc.	1	5	6

Roof, Sides and Ends :

5-ft. Asbestos sheets	14	17	5
Ridge tiles	4	9	10
6-ft. Corrugated iron sheets for sides and ends ..	5	18	9
Nails, etc.	0	12	0

Floor :

Building of concrete wall 2 ft. 6 in. below corrugated iron, floor, channel, and feeding troughs, concrete path 40 ft. × 4 ft., catchpit, 6-in. drains to main drain 40 ft. away. Also included, cost of concrete used to support wooden sections and time of skilled workmen	43	17	0
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Internal Fittings :

100-ft. galvanized iron 2-in. water piping (second-hand) for main divisions	0	10	0
10 iron sheets (22 gauge) for divisions	1	5	0
Couplings, bolts, etc.	0	2	6
Blacksmith's time and materials	1	5	6
12 cow chains	2	0	0
Three windows (4 ft. × 4 ft.) and double doors ..	6	16	0
14 6-ft. lengths galvanized 4-in. guttering, brackets, outlet, etc.	1	18	7
Joiner and assistant's time	23	0	0

£115 18 1

[The foregoing description of a serviceable cowshed, erected at comparatively small cost, is published by the Ministry as a commendable example of self-help, but with reservations on some points of the construction, as these would not be favourably regarded in the event of a loan application.]

The wooden uprights, resting on bricks and partly buried in concrete, would be apt to decay at the base, more especially as, in this instance, they are exposed to the effect of wet, inside and outside, at the floor and ground levels respectively. An alternative method would be to make the dwarf concrete wall continuous round the building (except, of course, at the doorway), the uprights being notched into a wallplate resting on the top of the wall and secured to it by bolts embedded in the concrete when it is being filled in.

AN INEXPENSIVE COWSHED

The roof trusses are not braced for stiffening and the support of the purlins. In this instance, a cheap method of stiffening would have been to nail planking to the sides of the principals.

The stall divisions, consisting of iron plates secured at the tops to the water piping, the bottoms being embedded in the concrete flooring, may prove successful. They will, no doubt, be subject to bumps, strains and pressure, and are specially subject to decay near the floor line. Concrete walls, reinforced with one of the numerous steel meshings, might be a serviceable alternative. There do not appear to be any openings in the manger divisions to permit thorough washing down. The height of the manger front is presumably kept low deliberately, as the 5 ft. standing, with 9 in. step to channel, is short for loose chain tying.

As regards covering materials, asbestos sheeting is not particularly resistant to heat and cold; anyone who could afford to do so would give an underlining to the roof, and a lining especially to the corrugated wall coverings. Normally, these linings would be of boarding, limewashed. Weatherboarding might be considered as an alternative for the corrugated iron.]

NORTHAMPTONSHIRE FARM INSTITUTE

POULTRY DEPARTMENTS

A. P. LIVINGSTONE,

Ministry of Agriculture and Fisheries.

The Institute Farm Department. The system on which the Poultry Department is conducted at Moulton differs from that usually found at similar institutions in that it is not a distinct unit separate from the farm as a whole. The principle that has been adopted, and that has proved very successful during the past dozen years, is the running of poultry with other farm stock. This is in conformity with the general practice of the county, for the general farmer is the mainstay of the industry in Northamptonshire, although there are, of course, a number of specialized poultry holdings.

The adult stock numbers approximately 1,000 head—Rhode Island Reds and the White Leghorn-Rhode Island Red cross, distributed among the various fields. "Home Close" (10½ acres) contains four houses of the orthodox semi-intensive type, each capable of holding 100 birds with an allowance of 3½ sq. ft. to each; here the Rhode Island Red pullets are trap-nested. These birds are allowed free range. This field was first used for poultry 13 years ago and has been in continuous use ever since. The breeding stock is drawn from here after the pullet year.

The permanent breeding pens are situated in a 5-acre field adjoining the Institute buildings. 100 birds are mated in single breeding pens and 60 in one flock. These pens have been on the present site for six years; for the previous six they were on another portion of the same field. The ground is rested for three months in the year and either limed or slagged annually. There are some 60 additional breeding birds on range elsewhere.

To demonstrate the slatted-floor system there are four houses of this type, each accommodating from 60 to 70 birds on free range, in a 12-acre field farther distant. These are moved once a week but have been located in that field for the past 5 or 6 years. Here there are also 8 fold-units, each taking 25 birds, but these are transferred to the grass orchard



FIG. 1.—Early-hatched chickens in night arks.



Photos : Miss J. W. Strang.

FIG. 2. —A section of the permanent breeding pens.

To face page 348.



FIG. 3.—A folding unit.



Photos: Miss J. W. Strang.

FIG. 4.—Breeding White Leghorn—Rhode Island Red first cross on free range.
Note stock-proof barbed-wire guard.

POULTRY AT THE NORTHANTS FARM INSTITUTE

to manure the fruit trees for about 6 months of the year, when spraying is not in progress.

In addition, there is a small laying battery for 24 birds. This is a fairly recent innovation dating from May, 1935, but it may be said in passing that November-hatched pullets have done extraordinarily well in it.

Sheep graze the breeding pens, and birds on free range share the fields with cattle, sheep and horses. The field that contains the permanent breeding pens is the only one to which preference is definitely given to the poultry in the matter of stocking. The houses in all others must be made stock-proof.

Incubation is carried out by means of small-sized hot-air and hot-water machines in the farm cellar. The total egg capacity is 850. The sole purpose is replacement of stock. A small number of hatching eggs are sold, but no day-old chicks. Up to the time of taking over the Thomas Harrison Farm (see below) 1,400 chicks were reared annually for the last dozen years. During the last two seasons it has been necessary to rear 3,000 chickens each season for replacement on the 2 farms. In view of the comparatively small number of breeding stock and the limited incubator capacity, hatching starts at the end of November and continues until April. The figure includes 200 to 300 Light Sussex or crosses for table at Christmas. There has been no natural hatching for ten years. Provision has been made in the 1936-37 estimates for the installation of a 2,000-egg incubator.

The "old" brooder-house, holding 400 to 500 chickens, now contains electric and oil brooders for instructional purposes. Last year, the "new" brooder-house came into use; this is fitted up on the hot-water system and is capable of taking 1,000 chicks. Up to 5 weeks of age the chickens are reared intensively in these open-fronted houses; they then go, if the weather be cold, to solid-floored colony houses, or, if conditions are more favourable, direct to slatted-floor night arks. All are in arks at 8 weeks, whatever the weather, and here they remain until they go to their permanent laying quarters. In the early stages the rearing ground is in a portion of the field containing the breeding pens, as it has been for the last 12 years. Later the birds are moved to any field available.

Ordinary home compounded rations are fed, and it is emphasized that no more than 10 per cent. of animal protein is ever used in mashes (i.e., not more than 5 per cent. of the

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total food). The dry mash and grain system is used, but for rearing an additional wet mash is given to cockerels and late-hatched pullets and to the laying stock for 4 months in winter; cod-liver oil is added to the breeders' rations.

Permanent labour is restricted to the employment of one poultryman in term-time, with the help of a youth in the vacations. It should be noted that should a student be retained at the end of a term he is paid; in other words, there is no unpaid labour except that of students during term.

No White Leghorn female stock is kept; for crossing with Rhode Island Red hens, White Leghorn cockerels are reared from sittings obtained from Accredited Stations or purchased at the annual County Cockerel Sale.

An interesting departure from accepted practice is that no second-season birds are retained merely for laying purposes; they are only kept on if required for breeding.

Besides the special Christmas trade mentioned above, the surplus cockerels—some 1,200 or 1,300 in number—are fattened-off in fold-units (otherwise empty at that time of year), or are kept intensively in the brooder-houses. A few are finished in fattening coops. There is occasional cramming for instructional purposes, but this is not a regular practice.

There is a flock of 30 Khaki-Campbell ducks, and a few turkeys are reared intensively.

There has been no serious outbreak of disease for many years. Fowlpox occurred five years ago and the whole stock was vaccinated. Ten years ago B.W.D. broke out amongst the chickens, but all breeding stock are blood-tested and there have been no reactors for six years. There has been no Coccidiosis. The losses amongst the young stock up to the laying stage vary between 10 and 15 per cent. This includes deaths from crowding, accidents and culled weaklings. Many batches are reared without any loss, but on the other hand casualties may be caused, from time to time, through the inexperience of students in the early stages of their training. With regard to mortality amongst adult stock, it is difficult to state this in the usual form of a percentage. The number of adult birds that died from the beginning of January to the end of December, 1935, was 66. The number of adult stock, however, varied from month to month throughout the year, on account of culling and also the disposal of second-year birds to make way for pullets. Taking the average throughout the year as 1,000 adult birds, the mortality works out at

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approximately 7 per cent. Most of these were pullets of the November and December hatches that came into lay early and suffered from prolapsus of the oviduct. The figure would no doubt be increased if it were not for the fact that a few birds are culled periodically and disposed of for table purposes, instead of being retained, as would be the case in laying trials, the figures of which have attracted much attention of late. Regular culling is considered very important in maintaining the general health of the stock; no other precautions are taken, apart from keen observation and the absence of forcing methods, but it is interesting, in view of current controversy, to note that there has been no breeding from pullets for the last eight or nine years.

The following are the poultry trading profits from 1928 to 1935:—

Year ending March 31, 1928	Profit	£	s.	d.
" " " 1929	"	118	16	5
" " " 1930	"	151	15	1
" " " 1931	"	167	4	0
" " " 1932	"	89	14	11
" " " 1933	"	257	9	10
" " " 1934	"	264	19	4
" " " 1935	"	262	15	3
" " " 1935	"	169	0	2

The total head of stock has been gradually increased since 1928, and it is only during the years 1932-5 that numbers have been in the neighbourhood of 1,000 adult birds. The smaller profit for 1935 is possibly accounted for by a certain amount of overlapping in accounts between 1934 and 1935; indeed, there was probably less actual difference between the two years. These profits are net profits after deducting all charges. The Poultry Department pays a rent of £15 to the farm for the use of the land. The houses are depreciated each year and all small equipment is written off during the year of purchase. The total depreciation on equipment last year was £127 9s. 9d. Anything in the nature of horse labour, which is hired from the farm, is charged to the Poultry Department, so that the accounts can be taken as including anything that could legitimately be charged to a poultry department on a general farm.

The Thomas Harrison Farm, Poultry Department. The Thomas Harrison Farm of 175 acres, situated 8 miles away, near Wellingborough, was taken over in 1933.

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One grass field of 15 acres has been allotted for poultry, and at the present time carries 700 laying birds on the Baker unit system. The object is to demonstrate a method of running poultry on the general farm for commercial egg production. The flocks are not mated or trapnested, and the pullets are drafted from the Institute Farm when between 3 and 4 months old. The average number in the first year was between 400 and 500, but lately has been increased to 700, of which about 450 are pullets, and this is likely to remain a stationary figure for the present. The flock consists of Rhode Island Reds and the White Leghorn-Rhode Island Red cross.

Eight houses are of the orthodox Baker unit type and the remaining two are the early Hamilton models. Owing to the slope of the field, their movement is restricted more or less to a comparatively narrow strip. As at Moulton, the adult mortality figure has not exceeded 10 per cent. annually from all causes. Apart from odd deaths and ovarian trouble among some of the earliest-hatched pullets, the main loss appears to be due to the depredations of foxes—the farm is in noted hunting country.

Feeding is on orthodox lines, corn twice daily and dry mash *ad lib.* There is a stream close at hand. Houses are moved every week and cleaned out, and perches creosoted once a month. Egg collecting and packing is the only other work. Up to the present the poultry work has been carried out by ordinary farm labour, with the consequence that there has been continual change of personnel, but arrangements have just been made for one person to attend the birds regularly (with his other farm duties). The time-sheets show that the lad now employed takes about 4-5 hours daily to do the job.

It is interesting to note that the average egg-production for the year Oct., 1933, to Sept., 1934, from 250 White Leghorn-Rhode Island Red pullets, was the remarkable one of 202 eggs per bird.

The writer is indebted to Miss J. W. Strang, N.D.D., Chief Instructress in Dairying and Poultry-keeping at the Institute, for co-operation in the preparation of this article and for supplying the photographs to illustrate it.

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Milk Marketing Scheme: Committee of Investigation. The Minister has informed the Milk Marketing Board of his decision regarding the findings of the Committee of Investigation for England on that section of the complaints as to the operation of the Milk Marketing Scheme made by the Central Milk Distributive Committee and the Parliamentary Committee of the Co-operative Congress, concerning the wholesale price of milk for liquid consumption.

The Minister has requested the Board to modify the scale of regional prices previously prescribed by reducing the price, in the months of May, June and September, by 1d. per gal. The Board have passed a resolution complying with the Minister's request.

Sales during May, 1936. The revised wholesale liquid milk price for May was 1s. 0½d. per gal., the same as for the corresponding month last year. The ½d. represents the purchasers' contribution, under the terms of the contract, towards the publicity fund established by the Milk Marketing Board; a similar contribution was made by producers by an allocation from the Board's funds.

Pool prices and rates of producer-retailers' contributions for May, 1936, are given below, with comparative figures for April, 1936 and May, 1935.

Region	Pool Prices			Producer-Retailers' Contributions		
	May 1936 d.	April 1936 d.	May 1935 d.	May 1936 d.	April 1936 d.	May 1935 d.
Northern.. ..	8½	11½	9½	2½ ³ / ₈	4	2½
North-Western ..	8½	11½	9½	2½ ³ / ₈	4	2½ ⁷ / ₈
Eastern	9	11½	9½	2½	3½ ³ / ₈	2½ ⁷ / ₈
East Midland ..	8½	11½	9½	2½ ³ / ₈	4	2½
West Midland ..	8½	11½	9	3	4½ ³ / ₈	2½ ⁷ / ₈
North Wales ..	8½	11½	9½	3	4½ ³ / ₈	2½ ⁷ / ₈
South Wales ..	8½	11½	9½	2½ ³ / ₈	4	2½
Southern.. ..	9½	11½	9½	2½ ⁷ / ₈	3½ ³ / ₈	2½ ¹ / ₈
Mid-Western ..	8½	11½	9	3	4½ ³ / ₈	2½
Far-Western ..	8½	11½	9	3	4½ ³ / ₈	2½
South-Eastern ..	9½	12½	10	2½	3½ ⁷ / ₈	1½
Unweighted Average	8·8	11·52	9·41	2·78	3·98	2·32

These prices do not include the accredited producers' premium of 1d. per gal., or any premiums for special services or level deliveries.

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The number of accredited producers who qualified for the addition of 1d. per gal. was 16,211, and the sum required for the payment of the premium was equivalent to a levy of 341d. per gal. on all milk.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, the same amount as in May, 1935.

Sales on wholesale contracts were as follows:—

	<i>May 1936 (estimated) Gal.</i>	<i>May 1935 Gal.</i>
Liquid	48,031,378	48,676,946
Manufacturing	42,531,859	40,565,392
	<hr/> 90,563,237	<hr/> 89,242,338
Percentage liquid sales ..	53·0	54·5
Percentage manufacturing sales ..	47·0	45·5

The average realization price of manufacturing milk during May was 4·755d. per gal. compared with 5·01d. per gal. for May, 1935. The quantity of milk manufactured into cheese on farms was 2,642,717 gal., compared with 1,342,723 gal. in April and 2,187,364 gal. in May, 1935.

Regional Elections. Elections of Regional members took place in four Regions on June 6. Mr. O. M. McBryde, the retiring member, was returned unopposed for the Northern Region and Messrs. G. E. Harris, F. Whittingham and W. Maddicott, retiring members, were re-elected for the West Midland, North Wales and Far Western Regions, respectively.

Annual General Meeting. The third Annual General Meeting of registered producers was held on June 11, at which the Report of the Board on the working of the Scheme and the Statement of Accounts for the year ended March 31, 1936, were presented. The quantities of milk dealt with by the Board during the financial year, with comparative figures for the previous year, as quoted in the Board's Report, were as follows:—

	<i>1935-36 Gal.</i>	<i>1934-35 Gal.</i>
Sold by Wholesale under Contract ..	868,386,015	783,423,794
Producer Retailers' Sales	103,698,446	105,941,285
Farmhouse Cheesemakers' Sales	15,182,443	21,319,415
Milk for Schools sold direct by Producers	4,046,005	2,017,092
Totals ..	<hr/> 991,312,909	<hr/> 912,701,586

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The respective quantities sold in the liquid and manufacturing markets during each year were as follows:—

	1935-36		1934-35	
	<i>Gal.</i>	<i>Per cent.</i>	<i>Gal.</i>	<i>Per cent.</i>
Liquid	656,775,327	66·25	650,451,983	71·27
Manufacturing ..	334,537,582	33·75	262,249,603	28·73
Totals ..	<u>991,312,909</u>	<u>100</u>	<u>912,701,586</u>	<u>100</u>

The value of milk sold through the Board under wholesale contracts during the year was £43,561,098 compared with £39,321,833 in the previous year. The cost of administration of the scheme was equivalent to approximately 10d. per gal. on all milk dealt with by the Board.

Milk Scheme Amendments: Poll on question of submission. A poll will take place on the question whether the amendments of the scheme shall be submitted to the Minister, and the Board have forwarded voting papers to every registered producer entitled to vote. The voting paper should be returned, duly filled in, so as to reach the offices of the Board on or before July 7, 1936.

Pigs and Bacon Marketing Schemes. *Pig Prices for June, 1936.* The basic pig price (Class I, Grade C) for June, 1936, was 11s. per score compared with 11s. 4d. for May. The cost of the feeding-stuffs ration was 7s. 9d. per cwt. The decline in pig prices was due to a fall in the ascertained bacon price from 89s. 8d. to 87s. 1d. per cwt. and also to a drop in the realization value of offals from 9s. 10d. to 9s. 2d. per pig.

Terms and Conditions of the Bacon Pig Contract for 1937. The Joint Policy Committee of the Pigs and Bacon Marketing Boards, set up a short time ago under the Chairmanship of Sir Robert Greig, have announced that agreement has practically been reached on the terms of the 1937 contract, with the exception of the question of equitable distribution of supplies of pigs to the factories.

Subject to this difficulty being removed, the following terms can be obtained by pig producers:—

PRICE. Within the Class I weight range of 7 sc. 2 lb. to

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8 sc. 7 lb. guaranteed average minimum prices will be as follows:—

<i>Total Number of Pigs on Contract</i>	<i>Guaranteed Average Minimum Prices per score</i>		
	<i>No. 1 grade</i>	<i>No. 2 grade</i>	<i>No. 3 grade</i>
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
2,200,000 to 2,599,999	11 9	11 6	11 3
2,600,000 to 2,699,999	11 10	11 7	11 4
2,700,000 to 2,799,999	11 11	11 8	11 5
2,800,000 or over	12 0	11 9	11 6

The minimum guaranteed price in each grade, therefore, increases by 1d. per score for each complete 100,000 pigs over 2,500,000 up to 2,800,000.

The minimum prices will be graduated to meet seasonal variations, e.g., if the number of pigs contracted for is 2,800,000 or over, then this guaranteed minimum price would be varied throughout the year as under:—

		<i>Guaranteed Minimum Price per score</i>		
		<i>No. 1 grade</i>	<i>No. 2 grade</i>	<i>No. 3 grade</i>
		<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
January ..	12 9	12 6	12 3	
February ..	12 9	12 6	12 3	
March ..	12 9	12 6	12 3	
April ..	12 3	12 0	11 9	
May ..	11 9	11 6	11 3	
June ..	11 6	11 3	11 0	
July ..	11 6	11 3	11 0	
August ..	11 6	11 3	11 0	
September ..	11 6	11 3	11 0	
October ..	11 6	11 3	11 0	
November ..	11 9	11 6	11 3	
December ..	12 6	12 3	12 0	

These prices are fixed on the basis of green sizeable bacon having an ascertained value of not more than 88s. 10d. per cwt.

To secure the minimum price, it is essential that producers should contract for not less than 2,200,000 pigs, as if they do not do so, it is impossible for the curing industry to offer such terms as are here set out, and the whole position, will, in that event, be submitted to the Bacon Development Board for settlement.

To the minimum price payable to the producer, there will be added 1d. per score for each complete 1s. 2d. whereby the ascertained bacon price exceeds 88s. 10d. per cwt. There will be no corresponding deduction when the ascertained bacon price falls below 88s. 10d. per cwt.

FOOD PRICES. 1d. per score will be added or deducted, when the ascertained price of bacon is in excess of 88s. 10d.

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per cwt., for each complete 3*d.* whereby the food price is above or below 7*s.* 6*d.* per cwt. No account will be taken of rises or falls in food prices when bacon is 88*s.* 10*d.* per cwt. or less.

DIFFERENCE IN PRICE BETWEEN CLASSES. The difference between the price per score in the various Classes is as follows:—

Class II. (Over 8 sc. 7 lb. to 9 sc. 0 lb.)	} 3 <i>d.</i> per score less than Class I.
Class III. (Over 9 sc. to 10 sc. 10 lb.)	

GRADING. The grading of pigs for the Wiltshire trade will be related to a standard of classification of bacon laid down by the London Provision Exchange. In all cases, grading will be strictly supervised.

DELIVERY TOLERANCE FOR PRODUCERS. It has been arranged that the producer may expedite delivery of pigs one month or postpone delivery one month, otherwise no tolerance or variation will be allowed in deliveries of pigs contracted for. Pigs delivered in a month other than the month of contract, will be paid for at the lower of the prices ruling either in the month of delivery or the month of contract.

LEVEL DELIVERY AND BONUS SCHEME. The provision in the present contract, that not less than 25 per cent. of the pigs covered by the contract must be contracted for delivery in the first four months and not more than 45 per cent. in the last four months, will be retained in the 1937 contract.

As provision is made for a higher guaranteed pig price in the early months of the year, the Bonus Scheme which operated in 1935 and 1936 will be discontinued.

Pigs Marketing Board: Co-opted Members. The Pigs Marketing Board, after consulting the Market Supply Committee, have co-opted Sir Arnold Gridley and Mr. Ernest Thornton-Smith to be members of the Board in accordance with the terms of the Pigs Marketing Scheme (Co-opted Members) Order, 1936, recently made by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

Hops Marketing Scheme. At meetings held for the election of District Members of the Hops Marketing Board, all the retiring Members were returned unopposed. The Board have re-elected Mr. W. J. Woolrich as Chairman and Mr. G. H. Edwards as Vice-Chairman of the Board.

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Sugar-Beet Marketing Scheme : Notice of Submission.

A scheme under the Agricultural Marketing Acts, 1931 to 1933, for the regulation of the marketing of sugar-beet in Great Britain has been submitted to the Minister of Agriculture and Fisheries and to the Secretary of State for Scotland. This draft scheme takes the place of one previously submitted, which was withdrawn by the promoters for examination in the light of the Government's proposals in relation to the sugar industry.

Copies of the draft scheme may be obtained on payment of 6d. per copy (post free) from the Secretary, National Farmers' Union, 45, Bedford Square, London, W.C.1, or from the Secretary, National Farmers' Union of Scotland, 6, Ainslie Place, Edinburgh, 3, or may be inspected on personal application at the above-mentioned addresses (except on public holidays) between the hours of 10 a.m. and 5 p.m. on weekdays and 10 a.m. and 12 noon on Saturdays. Any objections and representations with respect to the scheme should be made to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland and should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, the Under-Secretary of State for Scotland, Scottish Office, Whitehall, London, S.W.1, or the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, 2, so as to reach them not later than August 8, 1936; objections received after that date will not be considered. Every objection and representation with respect to the scheme must be made in writing and, in the case of objections, the ground of objection must be stated.

Consumers' Committee for Great Britain : Report on Potato Marketing Scheme. The Consumers' Committee for Great Britain have submitted an interesting report to the Minister of Agriculture and the Secretary of State for Scotland on the operation of the Potato Marketing Scheme. Copies of the report may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, S.W.1.

The Committee have not found any evidence that the interests of consumers have been prejudiced by the operation of the scheme; on the contrary, they consider that to the extent that it may have resulted in the better grading of

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potatoes, together with a more steadily remunerative price to producers, consumers will have benefited. They urge the importance of securing that the expansion of consumption of potatoes among the poorer classes of the community should not be prevented or retarded.

The Committee reviewed the working of the provisions relating to the excess acreage levy, the riddle regulations and the system of authorization of merchants—the last-named with particular reference to the Markets Plans Scheme.

The Committee are of opinion that the operation of the excess acreage provisions has not, up to the present, adversely affected the interests of consumers and they do not consider that the administration of the riddle regulations has been too stringent. They recommend that the Board should consider the advisability of making “seconds” (i.e. somewhat smaller potatoes than would be allowed by the general riddle) available at all times so that purchasers of severely restricted means can buy them cheaply.

As to the Markets Plans Scheme, the Committee remark that its operation requires to be watched in a year of normal or surplus production before its effect can be fully judged, but they make some comments on the details of the scheme, the more important of which are as follows:—

- (i) The practical effect of the scheme is to set up a system of price regulation.
- (ii) If it were a common practice for merchants to hold stocks for a rise in price, the scheme might be open to abuse.
- (iii) If, under the scheme, the trade is less speculative than formerly and merchants are secured against price-cutting, they ought to be able to work on narrower margins than in the past.
- (iv) The margins and prices fixed under the scheme should be published and closely supervised by the Board.
- (v) It is desirable in the interests of consumers that the right of free sale between registered producers and retailers should be preserved, at any rate, so long as a Markets Plans Scheme is in operation.

The Committee examined the general trend of growers' wholesale and retail prices and margins over a period of years and reached the conclusion that average prices and margins this year appear to compare not unfavourably, from the point of view of consumers, with those of pre-scheme years when production was about the same. They point out, however, that retail prices in February, March and April of this year do not appear to have reflected the lower growers' prices prevailing in those months.

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The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, to producers of certain classes of fat cattle in Great Britain and Northern Ireland, amounted by June 12 to £6,694,522. These payments were in respect of 2,817,358 animals, the average payment per beast being £2 7s. 6d. Some 850,000 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Extension of Subsidy Period. An Order was made under the Cattle Industry (Emergency Provisions) (No. 2.) Act, 1935, by the appropriate Ministers on June 15, extending the period within which subsidy is payable from June 30 to October 31, 1936. This Order was confirmed by Resolutions passed in both Houses of Parliament.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to June 15, 1936, in respect of manufacturing milk are as follows:—

Section of the Milk Act, 1934		Manufactured April, 1934, to March, 1935		Manufactured April, 1935, to March, 1936	
		Gal.	Amount	Gal.	Amount.
	<i>Milk Marketing Board for England and Wales.</i>		£		£
1	In respect of milk : Manufactured at factories other than the Board's	152,950,696	997,626	204,869,617	973,110
2	Manufactured by the Board ..	846,293	5,924	1,727,369	6,926
3	Made into cheese on farms ..	18,424,801	113,074	11,351,199	48,325
	Total for England and Wales ..	172,221,790	1,116,624	217,948,185	1,028,361
6	<i>Government of Northern Ireland.</i>				
	In respect of milk : Manufactured into cream and butter at registered creameries ..	18,281,963	164,111	23,940,856	132,767
	TOTAL ..	190,503,753	1,280,735	241,889,041	1,161,128

Milk-in-Schools Scheme. Exchequer contributions up to June 15, 1936, towards the expenses of the Milk Marketing

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Board for England and Wales in respect of the supply of 34,591,734 gal. of milk to school children at reduced rates during the months October, 1934, to March, 1936, amounted to £671,026. 13,100,293 gal. of milk were consumed during the first six months of the scheme as compared with 11,749,726 gal. consumed during the corresponding months in the second year. The latter figure will, however, be increased slightly when further returns are received for February and March.

Cheese Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936, (whether by the Exchequer to Milk Marketing Boards, or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese milk price has been certified by the Minister and the Secretary of State for Scotland, to be 4·71 pence per lb. for the month of June, 1936.

Wheat Act, 1932 : *Sales of Home-grown Wheat—Cereal Year 1935-36.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to June 5, 1936, cover sales of 30,964,244 cwt. of millable wheat, as compared with 32,785,493 cwt. in the corresponding period (to June 7) in the last cereal year.

Accounts of the Millers' Quota Fund. Under Section 12 (2) (c) of the Wheat Act, 1932, the Minister, with the approval of the Treasury, has made the Millers' Quota Fund (Form of Accounts) Regulations, 1936. The Regulations have been published as Statutory Rules and Orders 1936, No. 512, price 1d. net.

Beet Sugar : *Appointment of Sugar Commission.* The Minister, with the consent of the Treasury, has appointed the following to be members of the Sugar Commission constituted under Section 1 of the Sugar Industry (Reorganization) Act, 1936 :—

Lt.-Col. Francis Balfour, C.I.E., C.B.E., M.C. (Chairman).

Mr. W. H. Coates, Ll.B., D.Sc., Ph.D.

Mr. H. L. H. Hill, M.A., F.C.A.

Mr. F. Kershaw, O.B.E., J.P.

Mr. S. K. Thornley.

The Secretary of the Commission is Mr. G. G. Barnes, to whom all communications should be addressed at the offices of the Commission, Queen Anne's Chambers, 41, Tothill Street, London, S.W.1.

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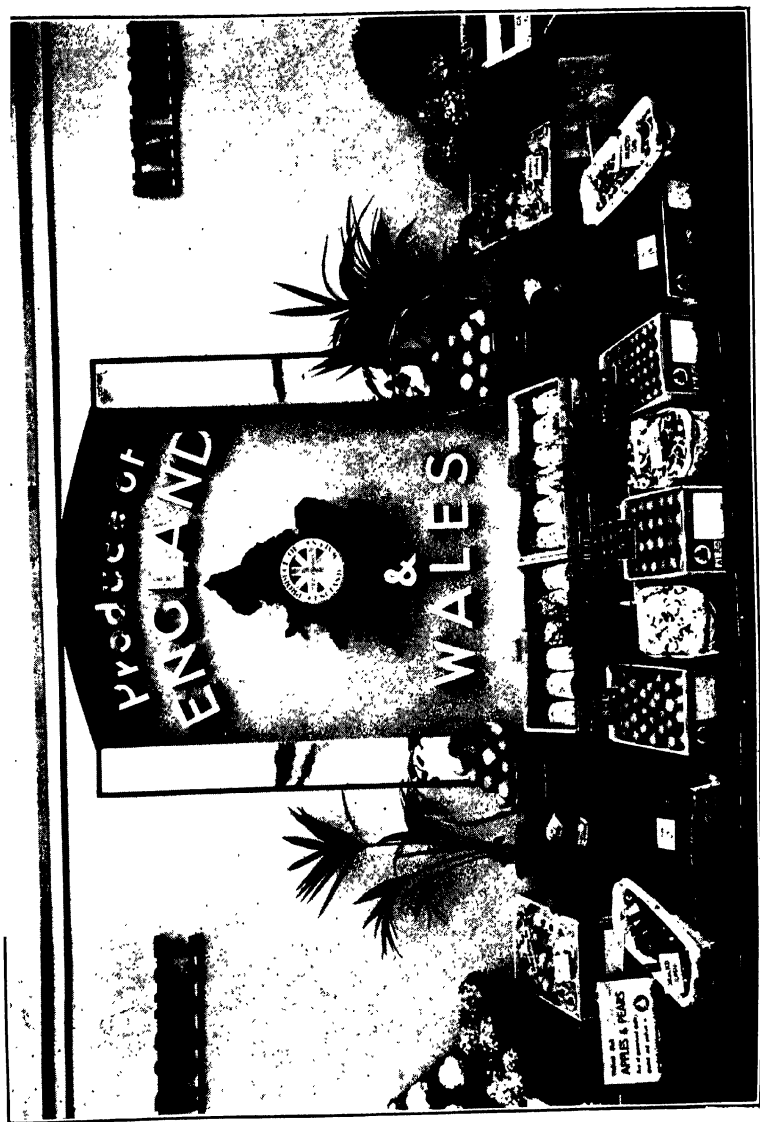
The British Sugar Corporation, Ltd. The British Sugar Corporation, Limited, into which the beet-sugar manufacturing companies are being amalgamated, has now been registered as a public company with a capital of £5,000,000. The Arrangements in accordance with which the amalgamation is being effected were summarized in this JOURNAL for May, 1936 (pp. 141-145).

The Chairman of the Corporation is Lt.-Col. Sir Francis Humphrys, G.C.M.G., G.C.V.O., K.B.E., C.I.E., and the other Government Directors are Sir Louis Kershaw, K.C.S.I., C.I.E., and Major John Leslie, D.S.O., M.C. The remaining members of the Board are Mr. Henry Beacon, Mr. H. E. Carter, Mr. B. A. Forster, Mr. Walter Johnson, Mr. F. M. K. Kielberg, Mr. J. N. Mowbray, Mr. A. Palache and Mr. J. B. Talbot-Crosbie. The Secretary of the Corporation is Mr. Alfred Wood, F.C.A., and the Registered Offices are at Inveresk House, 346, Strand, London, W.C.2.

National Mark Fruit Products. One of the problems confronting the grower of fruits in this country is that of finding a commercial outlet for fruit which: (1) although sound is not suitable for the fresh, canning or jam markets, or (2) may be in general, or local, over-supply from any cause.

Recent research suggests the possibility of the increased commercial utilization of home-grown fruit juices for use in beverages having a fruit base. In the interest of the home fruit grower, it is desirable that as much as possible of the demand for fruit products should be met by products derived from home-grown fruits, and the Ministry, after consultation with representatives of growers, manufacturers and the trade, has accordingly prepared a National Mark scheme providing standards for some of the products concerned.

Many technical problems remain to be solved before a scheme of standardization under the National Mark can be made applicable to all fruit products, but much progress has already been made in the technique of production of fruit juice syrups for which a satisfactory demand is developing. The National Mark scheme, therefore, will be confined in the first instance to two grades of fruit juice syrups, viz., "Select Fruit Juice Syrup" and "Select Fruit Juice Syrup (Milk Shake Grade)." It is hoped that the scheme will be in operation early this month.



A section of the Ministry's Exhibition of National Mark Produce at the May, 1936, Agricultural Shows.



Demonstration Exhibit of National Mark fruit juice syrups at the Bath and West Show, 1936

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Definitions of quality have been issued in the form of draft regulations under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931. These specify certain requirements as to flavour, colour, specific gravity, alcoholic content, and the use of sweetening materials and preservatives.

Quality control will be ensured by an inspection of premises and of produce, before and in process of manufacture, and by the taking of samples of the finished product. The examination of samples will be carried out by a panel of three members of the National Mark Cider, Perry and Fruit Products Trade Committee.

Makers and bottlers not enrolled in any of the National Mark Schemes relating to Cider, Perry, Canned Fruit and Vegetables, Bottled Fruit and Vegetables, and Jam, will normally be required to have an annual output of fruit juice products of not less than 3,000 gallons.

Full details of the National Mark scheme are contained in Provisional Marketing Leaflet No. 53, which may be obtained free of charge on application to the Ministry.

National Mark Dressed Poultry. A two-day's course of instruction for County Poultry Instructors in the marketing of table poultry was held by the Ministry on June 4 and 5 and was attended by 27 officers representing 22 counties in England and Wales. Visits were paid to National Mark Poultry Packing Stations in Essex and Suffolk and also to the Suffolk County Show at Stowmarket, where entries in competitive classes for market packs of table chicken were examined and discussed.

Marketing Demonstrations. In the May issue of this JOURNAL were given particulars of the Agricultural Shows at which the Ministry is staging marketing exhibits this year.

Exhibits have already been staged at seven of these Shows—the Devon County Show at Exeter, the Bath and West Show at Neath, the Shropshire and West Midland Show at Shrewsbury, the Three Counties Show at Worcester, the Essex County Show at Saffron Walden, the Royal Counties Show at Worthing and the Royal Norfolk Show at Norwich. An illustration of a section of the exhibit is shown on the accompanying inset. With the exception of the Essex and Royal Counties Shows, where tomato grading and packing demonstrations were staged, egg testing and grading demonstrations were given continuously throughout each

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Show. Of special interest to consumers were demonstrations of egg faults and their detection. It is felt that the propaganda effect of these demonstrations will be reflected in increased demands for National Mark eggs in the areas in which the Shows were held.

Demonstrations of apple grading and packing were given at Worcester where an exhibit was also staged with live animals to illustrate the types expected to yield carcasses of the grades defined under the Grade and Dead Weight Scheme for the sale of fat stock.

At the Bath and West Show a demonstration of the proposed grades of National Mark fruit juice syrups was given—see illustration on accompanying inset. These syrups must be made from fruit grown in England, Wales or Scotland and from pure sugar or glucose.

Germany: Rationalization of the Milk Industry.—All the interests in the German milk and milk products industry have been fused into a single organization for regulating supplies and marketing. The main provisions of the decree, which was promulgated on April 17, are as follows:

The competent authority is the Central Union of the German Milk Industry. All persons concerned in the production, processing or distribution of milk must be members of the associations incorporated in this Union. The objects of the fusion are the regulation of the marketing of milk and milk products and the assurance of supplies to the consumer. The Union has full powers to regulate the production, supply, sale, processing, manufacture and distribution of milk and milk products; to issue regulations as to marking and packing, deliveries, acceptances and warehousing; to fix the scale and scope of manufacturers' operations; to lay down the minimum turnover for distributors; and, temporarily or permanently, to eliminate unnecessary undertakings; to fix equitable prices and price margins; to create an equalization fund and impose contributions to this fund, in addition to suitable levies for overhead expenses; to prosecute those who contravene the regulations.

Provision is made for the payment of compensation to undertakings suffering loss as a result of measures taken under the decree, e.g., when a concern is closed down or is unable to continue in business. No compensation can be claimed for losses due to the fixing of prices or margins, or of the scale and scope of operations. Provision is made for arbitration in cases of dispute. The establishment of new undertakings and the erection of new processing plant are subject to the approval of the Central Union. Hotels, restaurants, hospitals and similar institutions are not considered to be distributors of milk in the sense of this decree.

An order dated April 25, 1936, in connexion with the Milk Law of July 31, 1930, lays down that after October 1, 1936, the technical direction of creameries or farm dairies will only be entrusted to persons who can produce evidence that they are technically qualified, in the form of a master's or similar diploma from a suitable institution and at least two years' successful technical direction of a creamery or farm dairy. (*Note by the Market Supply Committee.*)

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THE Forty-Sixth Meeting of the Council of Agriculture for England took place at the Middlesex Guildhall, Westminster, on June 19, 1936. *Alderman G. E. Hewitt, J.P.*, being elected to the Chair for the current year, in succession to Lt.-Col. Sir Merrik Burrell, Bart., C.B.E., J.P. (West Sussex), who was cordially thanked for his services during the past year. The Rt. Hon. W. E. Elliot, M.C., M.P., Minister of Agriculture and Fisheries, Mr. H. Ramsbotham, O.B.E., M.C., M.P., Parliamentary Secretary, and Sir C. J. Howell Thomas, K.C.B., K.C.M.G., Permanent Secretary, attended the Meeting.

The Standing Committee of the Council was re-elected as follows:—

Representatives of Landowners.—Sir Merrik Burrell, Lord Cranworth, Lord Eltisley, Sir Arthur Hazlerigg and Mr. C. H. Roberts.

Representatives of Tenant Farmers.—Mr. R. Bruford, Mr. James Hamilton, Mr. R. G. Patterson, Mr. Cecil Robinson and Mr. Clement Smith.

Representatives of Workmen.—Professor A. W. Ashby, Mr. George Dallas, Mr. G. E. Hewitt, Mr. W. R. Smith and Mr. Denton Woodhead.

Arising out of the Minutes, *Mr. W. R. Smith* and *Mr. H. W. Thomas* (Hants) asked what had been done about the derelict land in Hants, as to which the Standing Committee had presented a Report to the Council at the last meeting.

The Minister's Address. *The Minister* first of all congratulated Alderman Hewitt on taking the Chair at the Council and expressed the deep regret which all felt at the loss of the late Major F. H. Fawkes. He welcomed Major Fawkes's successor—Major Nelson Rooke—to the Council.

The position in agriculture to-day, he said, was that the attention of the whole country was being more and more focussed upon it. The impatience with the misuse or non-use of land was shown in the fact that before the Council got to business there were enquiries as to the McCreagh Estate. The Council had recommended three proposals for dealing with it: acquisition by the Commissioner for the Special Areas; acquisition by the County Council for small holdings; or acquisition by the Ministry under the Land Utilization Act. Much consideration had been given to all three proposals. As regards the first, the Commissioner had decided that he could not see his way to secure the land compulsorily: the County

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Council was not prepared to acquire it for small holdings; and the Ministry, owing to the peculiar circumstances of the Estate and the cumbersome machinery which would be involved under the Act, and other general considerations, were not able to proceed in the matter at the present time. He regretted this position very much: it was not good that a large piece of English soil should be derelict. He was not satisfied that the position should be left where it was, and he was anxious to see if something voluntary could not be done, as it was a reproach to everyone that their goodwill had not been sufficient to bring about a solution.

At the last Meeting, he had pointed out that it would not be possible for him to make a general statement on policy at that time. That held good for to-day, because general statements of policy were a little misleading, since in agriculture you had to proceed by putting brick upon brick, portion on portion of the industry; but notable advances had been made since the last Meeting. In May, Unemployment Insurance for agricultural labourers had become part of the law of the land. This measure would present problems of its own as time went on, and he thought that if it were operated in a grind or miserly spirit it might do more harm than good to the countryside. The movement upwards in wages, too, was a sign of good, because it indicated that the industry was taking its part in the problem of raising the consuming power of the people. As to the necessity for reasonable conditions for the agricultural worker, that was being brought home to the industry more and more every year. On the agenda paper that day were two important references to housing. He had been looking at the figures and thought it a pity that there should be such wide variations among the Counties. The Rural Workers (Housing) Acts had been operated in a number of Counties. The figures for reconditioning for certain Counties were as follows: Suffolk West 39, Suffolk East 784, Wiltshire 410, Yorks (East Riding) 24, Essex 618 and Devon 1,446. If the average for the country could be brought up to the figure of Devon, a very great deal of comfort, not only for the agricultural worker, but for his wife and children would be ensured.

The nation was looking more and more to agriculture because it would clearly be folly to rely entirely on foodstuffs from abroad. The prudent housewife wanted some of her supplies in the larder where she could lay hands on them.

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It was no use to say that there was plenty of food in the Argentine, or in North or South America, Asia, Africa or Australia. He was very much reminded of that when passing the long-term sugar policy Bill through the House. It had even yet to be argued with the towns that it was a desirable thing to preserve in this country some £5 million worth of sugar-producing machinery. It was an advantage to them and not a piece of parasitism on the side of the country, but a question of keeping up a vital necessity which this country had terribly lacked on one occasion, and might easily do so again. The home production of sugar in 1913-14 was 4,000 tons a year; in 1935-36 it was 470,000 tons a year. In 1917, the country paid for sugar £38 million; in 1920 £91 million for practically the same amount of sugar. Last year, the whole of our sugar bill—a much larger quantity (2 million tons)—was paid for with £18 million. In 1920, 1,300,000 tons was paid for with £90 million.

The Minister added that he would not wish to delay the Council that morning with any further statements. Announcements of policy had to be made from time to time in the House of Commons, and he had already recently announced that next week the Cattle Subsidy Act would be extended until the autumn. He was not yet in a position to make a statement on the long-term meat policy. He noticed Sir Arthur Hazlerigg's motion on the agenda and all he could say on that subject at the moment was quite definitely that the Government was by no means forgetful of the position, and that before the House rose he hoped to be able to make a statement which would carry the industry a great deal farther than they were to-day.

In conclusion, he would add a few remarks about milk. He would like to awaken public conscience to the fact that here was an invaluable foodstuff being produced in great quantities, and that it was an advantage to the country that these quantities should be produced and more and more bought and consumed as liquid milk. A considerable advance had been made with the Milk-in-Schools Scheme, though there were still some extraordinary differences amongst towns, in very similar financial and economic circumstances, as regards their ordinary consumption of milk. The percentage of children drinking it in Rotherham was 39, in Sheffield 64, in Grimsby 25, in Hull 60, in Cardiff 40, in Newport 65. Oxford had 36 per cent. and Cambridge 61 per cent. We

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could solve the milk question by killing 50,000 cows and keeping production down to the point where nothing but liquid milk was produced, but no one, of course, wished to do that. There was, indeed, no policy for restricting production in agriculture to-day, and it was clear that if the country neglected its agriculture it was neglecting something which might mean life or death to the whole nation if a crisis, such as the crisis which we had seen in the not too distant past, should come again upon us.

Mr. George Dallas, on behalf of the Council, thanked the Minister for his speech. He said that it was very valuable to the Council, which was the most representative gathering of agriculturists in the whole country, to hear the Minister's outline of the position from time to time. The Minister, however, was rarely able to give the industry all it wanted, but the Council recognized that in Mr. Elliot they had a Minister who was whole-heartedly interested in the industry and spared no effort to further its welfare. In moving his proposal, he regretted to say that Sir Charles Howell Thomas was attending for the last time before his retirement. His long experience and wise counsel had guided the Ministry through ten very difficult years, probably outside of wartime the most difficult and complicated period of agricultural policy that any nation had had to go through. During all these changes, Sir Charles had been at the helm to guide everyone concerned, and he wished to convey to him how much the Council appreciated this service and rendered him best thanks for it. *Sir Merrik Burrell* said he wished to associate himself with all that Mr. Dallas had said concerning Sir Charles Howell Thomas. He asked the Council to join with him in wishing Sir Charles the best of health for many years to come, and he hoped that he would be able still to use his abilities, even in retirement, to the service of his country. After the Council had signified agreement, Sir Charles Howell Thomas briefly replied, adding that the Department thanked the Council for its unfailing help.

Mr. Thomas said he was disappointed that nothing was being done about the McCreagh Estate. The reason the County Council had not acquired it was that they could not undertake so large an area of land and that they had only recently acquired, with the consent of the Ministry, a farm near Winchester, the equipment of which had not yet been completed and which was not all yet let. The Ministry had,

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stated as a reason for not acquiring the Estate that the Treasury had no funds available for the purpose. Recently, however, he had it on credible authority that a gentleman would be prepared to purchase the Estate, equip it and renovate the buildings and land, if the Ministry would acquire it under the Land Utilization Act. He hoped that the Ministry would give further consideration to this proposal. The County Council tried to get noxious weeds destroyed, but were having it continually thrown up at them that there were 3,000 acres in the midst of the County full of weeds, keeping people out of work as well. It was a disgrace to the County and a disgrace to the Country. *Mr. John Beard* joined in expressing disappointment. He said it was the principle with which he was concerned. It was an awful confession to make that 3,000 acres of derelict land in the country could not be dealt with. If the land had been wanted for an aerodrome it would have been acquired. As it was, the owner was able to defy authority. He thought that the Government was afraid of tackling this question in a communal fashion.

Lord Eltisley, K.B.E. (Cambs.) said he thought that steps should be taken to make it clear that a man who abuses his rights as a citizen should be promptly and effectively dealt with.

Mr. George Dallas said that he could pledge the Standing Committee to reopen this question as soon as it could and co-operate with Mr. Thomas and his colleagues in Hampshire. If it were possible to help the Minister to put the matter right the Committee would be very pleased to do it.

Consumption of Milk. *Mr. George Dallas*, on behalf of the Standing Committee, moved the adoption of the Standing Committee's Report on the Need for a Larger Consumption of Milk. (Appendix No. 1, page 375). He thought it one of the most interesting and valuable Reports the Standing Committee had ever produced, and hoped that every County Agricultural Committee would obtain copies of it and circulate it to every one of their members so as to secure the widest possible publicity. It happened that the direct interests of agriculture came into close relationship with direct interests of the community. It should be recognized that it was no fault of the industry that milk was dear and that if made

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cheaper it could not be made so at the expense of the producer. All were agreed that the margin between the producer and the consumer was too large and should be lessened by a reduction in the distributive costs.

Mr. W. W. Sampson (Dorset) said that the serious position to-day in the milk industry arose from the loss of balance in agricultural production. Many beef producers had turned their attention to milk simply because beef could not pay. Thirty-five years ago the country passed through as difficult a time as the present without the help of the Government: to-day he found that no less than 12-15 per cent. of the receipts of his farm were in the form of a subsidy from the Government. The way to right the industry was to restore its balance.

Lord Cranworth, M.C. (East Suffolk) supported the Report and drew attention to the statistics of milk drunk per head by the nations of Europe. He thought that the physique and health of those nations corresponded almost exactly with the amount of milk they drank. Sweden, Finland and Denmark headed the list with something over or under two pints per head per day. The lowest figure was Italy with rather less than one-third of a pint, and he regretted to say that in Great Britain it was not much more, being less than half a pint. *Mr. H. T. Cox* (Herts) congratulated the Standing Committee on its Report and hoped that it would be circulated to all Agricultural Committees. The Report was then put to the Meeting and adopted.

Housing of Rural Workers. *Mr. R. Bruford* (Somerset), on behalf of the Standing Committee, moved the adoption of its Report. (Appendix No. II, page 377). In his view the Government was acting most generously in its housing programme. A good deal of improvement was being obtained without the employment of statutory powers. *The Rt. Hon. Lord Hastings* (Norfolk) suggested that the table at the end of the Report was apt to be misleading because, in counties which operated the Act through the Rural District Councils, it did not state which R.D.C.'s did not act. There should be greater detail given. One of the first steps towards improvement would be to make the executive officials the same in all counties throughout England, and there would then be some likelihood of obtaining uniformity, at least in the county itself. Local Councils should approach owners

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with a definite request that their houses should be reconditioned, accompanying it with an offer to assist. Then, the larger the reserve of the owner, the more likely would the authority be to get the cottage reconditioned, without cost to the State: but the houses would be reconditioned.

Mr. W. Holmes criticised the statement in the Report that no petty considerations, such as reluctance to make grants to landowners and persons of means, should be allowed to stand in the way. He said that thousands of houses should never be reconditioned at all, they should be pulled down and rebuilt by the owner. Good new houses were required and thousands of the present ones should be destroyed. There was no water, no sanitation, and many were in a scandalous state. *Mr. J. Garton* (Essex) said that it was untrue to say that houses which had been reconditioned were still bad. The County Surveyor would not pass them unless there was water and every other usual requisite. The housing schemes certainly improved the position and the tenant in most instances paid the same rent as before.

Alderman W. B. Pinching (Middlesex) said that he knew something about Gloucester. In that county, according to the schedule, only 139 cottages had been dealt with. He was aware that applications which had been made had been turned down. In Gloucester, the week-ender was the man who was largely catered for and cottages let at rentals from £1 a week to them without any difficulty. He added that the root of the question was that most of the Rural Councils consisted of local tradesmen, who did not want to repair these cottages for the rural worker.

Mr. J. S. Gibbons (Gloucester) said that if *Mr. Pinching* would bring his complaint before the County Council of Gloucester it would be dealt with. He was sure that the Council was doing all it could to meet the position. The Report was then put to the Meeting and adopted.

Standardization of Petroleum and Tar Oil Sprays.
Mr. Cecil Robinson (Lincs, Holland), on behalf of the Standing Committee, moved the adoption of this Report on this matter.

Alderman J. W. Payne (Isle of Ely) said he would agree if it were intended later on, when further experiments had been made, to consider the question again. *Mr. Cecil*

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Robinson said that this was certainly the case. The Report was then put to the Meeting and adopted.

Uniformity in County Administration of Milk Orders. *Sir Merrik Burrell*, on behalf of the Standing Committee, moved the adoption of this Report. (Appendix No. III, page 381). The Report was put to the Meeting and adopted.

Tuberculin Test for Imported Cattle. *Sir A. G. Hazlerigg, Bart.* (Leicester), on behalf of the Standing Committee, moved the adoption of this Report. *Mr. D. G. Watkins* (Hereford) objected that breeding cattle from Ireland only were intended to be tuberculin tested. *Sir Arthur Hazlerigg* said that the Standing Committee had not intended to be discourteous and would look again at the position. The Report stood referred back to the Committee.

Standards for Designated Milks. *Mr. C. C. Smith* (East Suffolk) on behalf of the Standing Committee, moved the adoption of its Report on the resolution which had been referred to it by the Council on the subject of Standards for Designated Milks. The Report was then put to the Meeting and adopted.

Agriculture and National Defence. *Sir Merrik Burrell*, on behalf of the Standing Committee, moved:—

That the Council of Agriculture for England is seriously concerned over the position of the national food supply, which, in its view, is at present one of the weakest links in the chain of National Defence. Both the fertility of the soil and the means for increased production of foodstuffs are to-day less than they were in 1914 and subsequent years, when the shortage of food supplies placed the country in a most perilous position. The Council therefore desires to urge on the Government and, through it, on the country, the great national importance of this question. It suggests that those responsible for Defence should be requested to give it their instant attention so that adequate remedial measures may be at once set on foot.

He said that the resolution proposed that the Council should warn the Cabinet that in its opinion agriculture was in no position to-day adequately to fulfil its part in National Defence. The lowered reserves of fertility in the greater part of the soils of the country, and the fewer men employed to-day, made a rapid expansion of the production of foodstuffs absolutely impossible. Only a carefully thought out long-term agricultural policy, embracing all sections of the industry, would be likely to prove adequate. The previous

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week the Lord President of the Council had said that he was firmly convinced that agriculture was the first line in our National Defence. He agreed, too, that the Chancellor of the Exchequer's dictum that home industries should be helped, e.g., the lager beer industry, might be wisely applied to several sections of agriculture. If importations of meat and cattle from Southern Ireland were excluded, our meat production had gone down since 1914 by 210 metric tons and our imported beef had gone up by 300 metric tons. He thought the Southern Ireland supplies should be excluded as he did not think that we could safely always count upon them.

Major Nelson Rooke, F.S.I., seconded the resolution and referred to the great danger of the country being caught short of food supplies in time of war. If it were true that aircraft had improved to such an extent that shipping could be sunk with little difficulty, it was the nation's clear duty to ensure that from six to twelve months' reserve of foodstuffs should be available. If surpluses of home produce were necessary as a corollary to the scheme, then these could be used as cheap supplies for the thousands who were unable to buy proper nutritive food in sufficient quantities, e.g., those receiving unemployment relief could have vouchers entitling them to cheap milk, beef, potatoes, or any foods of which there might be surpluses. *Mr. A. Symonds* (West Suffolk) and others spoke on the motion, which was put to the Meeting and carried.

Live Stock Industry. *Sir Arthur Hazlerigg* moved:—

That the Council of Agriculture for England requests the Government to state (1) what in their opinion the price per hundredweight for fat cattle should be in order that the efficient feeder, rearer, and breeder should receive the reasonable remuneration mentioned in their White Paper of March, 1935; (2) whether a guaranteed price of this amount will be included in their long-term policy; and (3) when is the earliest moment when this long-term policy can be put into force?

He said that he did not expect the Minister to be able to answer these questions to-day, but he hoped they would be put to the Cabinet. He thought it was essential to have a guaranteed price so that there would be some profit out of which to pay the labourers' wages. *Capt. W. G. Coates* (Leicester) seconded the motion, which was put to the Meeting and carried.

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Rural Housing. *Alderman E. G. Gooch* moved:—

That the Council of Agriculture for England, being convinced that agricultural prosperity cannot be brought about until the social needs of the workers, particularly in relation to housing, are fully met, urges the Government to renew the subsidies without which it is impossible to build rural cottages at rents which farm workers can afford.

He said that little of an effective character had been done for farm workers in regard to housing. Most of the cottages erected in recent years had been let at rents which labourers were absolutely unable to pay. His aim was to obtain new and additional houses of good quality at rents they could afford. He suggested that rural housing difficulties could be overcome by a renewal of the subsidies so that R.D.C.'s could build many new cottages. In the district of one R.D.C. in Norfolk there were reported to be 109 cases in which the whole family lived in a house with only two bedrooms, and these cases could not be touched by the "overcrowding" Act. Was the Council really sure that no benefit from existing subsidies went to the landlord? *Mr. T. Lovell* seconded the motion. *Lady Mabel Smith* spoke on it from the women's point of view, and *Lord Hastings* voiced some general views arising from his experience as a rural landowner. *Sir Merrik Burrell* said that the Standing Committee would be very ready to go more minutely into this question, if the resolution was referred to it. *Mr. Gooch* and the seconder agreed that it might be and the resolution therefore stood referred to the Standing Committee.

Rabbit Pest. *Mr. W. Hearle* (Cornwall) moved:—

That in view of the fact that wild rabbits have increased to such an extent within recent years as to become a pest in many parts of the country, the Council urges the Government to prohibit the importation of rabbits for food. It considers that the establishment for a period of a better market for rabbit flesh for food would be likely to cause a rapid diminution in the numbers of wild rabbits.

He said that he would be content to leave the consideration of this question also to the Standing Committee. The motion was accordingly seconded and stood referred to that body.

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APPENDIX I

Report from the Standing Committee of the Council of Agriculture for England on the Need for a Larger Consumption of Milk

1. The Standing Committee has noted with interest the discussions which have taken place in recent months on the question of nutrition and its bearing on agricultural policy. It may be early yet to look for practical results, as it necessarily takes time first to accumulate accurate knowledge on nutritional questions and then to elaborate plans and schemes for using it of which the nation will approve, but the Committee welcomes the attention which is being directed to this subject, and considers that discussions on these lines are likely to be valuable both to the nation and to home agriculture.

2. The advice that the food of a considerable proportion of the poorer families of the community does not reach a satisfactory nutritional standard discovers no new fact; the case has, unfortunately, always been so. The importance of the advice is in its manner of presentation, in which for the first time, so far as we are aware, an attempt has been made to measure the extent of the deficiency, thus enabling an approach to be made to the problem from the agricultural angle on a practical basis.

3. There is little doubt that the commodity to which attention should be directed in the first instance—both from the point of view of public health and from that of agriculture—is milk. Milk is of outstanding nutritional value. The Advisory Committee on Nutrition, appointed last year by the Minister of Health and the Secretary of State for Scotland, pronounced milk to be a food "which contains all materials essential for growth and maintenance of life in a form ready for utilization by human beings," stating that "it contains the energy-giving nutrients, protein, fat and carbohydrate; all the known essential vitamins; calcium, phosphorus, iron, sulphur, iodine, magnesium, potassium, sodium, chlorine and copper, some of the physiological roles of which are known; and a number of other elements, present only in minute amounts, such as manganese, zinc, and fluorine, the exact functions of which are not fully understood, but which would seem to be as necessary for normal nutrition as any of the other constituents." (See the memorandum on "The Nutritive Value of Milk," H.M. Stationery Office, March, 1936.)

4. The statements in the next few paragraphs are taken direct from this official memorandum, which, on the problem of human digestion of milk, affirms that the "physico-chemical states of its constituents make for easy digestion and assimilation; the relationship of the different constituents to one another ensures normality of bodily function; the nature of its protein and of its mineral elements, notably calcium and phosphorus, and its high content of other inorganic elements and vitamins make for satisfactory growth and give it a very high value as a protection against disease." Milk is, in fact, a well-balanced mixed diet, though for babies it should be supplemented, after breast feeding ceases, with iron and vitamins D and C, preferably given in the form of natural foods such as egg yolk, orange juice, and cod-liver oil. "For children, adolescents and adults, a diet of milk alone is undesirable because it is deficient in energy-giving constituents relative to its bulk." For these, therefore, it should not be regarded as a complete food, but as an important item in a mixed diet; and because of "its growth-promoting properties it should form a larger proportion of the diet of children and adolescents than of that of adults. The expectant mother has to elaborate from her food the materials necessary for the growth of her offspring, while the nursing mother has to

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secrete milk to serve as the only food of her infant for at least six months. The milk requirements of the expectant or nursing mother are of a similar order to those of the growing child." As regards the amount of milk desirable for these special classes, the requirements of children are from one to two pints a day, and for the expectant and nursing mothers about two pints. A minimum of half a pint daily is stated to be desirable for any adult.

5. On the question of the effect of heat treatment on milk, it appears that the few human experiments which have been carried out have not shown that heat significantly lowers the food value of milk for man. This does not necessarily mean that heated milk is equal in all respects to raw milk, since such a conclusion could only be drawn if all that could be known about human nutrition and the nutritive properties of milk were known. The only significant change that has been noticed after the application of heat is the partial loss of vitamin C, and possibly of iodine, and these deficiencies can be made good, in the diet of babies, fed exclusively on cows' milk which has been heated, by the addition of fruit or vegetable juice and cod-liver oil, and in the diets of older people by the ingredients in other foodstuffs. (As regards this statement of the Advisory Commission on Nutrition, the Standing Committee agrees with the paragraph, but thinks that the deficiencies as regards the diets of babies fed exclusively on heated cows' milk are likely, in comparatively few instances, to be made good in the way suggested.)

6. So far as the disease aspect of unheated milk is concerned, milk can be a conveyor of disease to man in two ways: (1) organisms may be transferred from a diseased cow to its milk and through the milk to man, and (2) organisms may be introduced into the milk from the milkers or other persons who handle and deal with it, or from infected utensils. These organisms are destroyed and the milk rendered safe for consumption by suitable heat treatment, such as efficient pasteurization or boiling. The ideal milk "is milk from the perfectly healthy cows, but herds in which all the cows are perfectly healthy are at present relatively few. Where such milk is not available, the milk should be pasteurised or boiled before use." That statement appears to the Committee to sum up the situation very fairly. The quality of the milk supply of this country is rapidly improving, partly through the operation of the "Accredited Producer" and the "Attested Herd" schemes, and as the numbers of healthy herds increase and as methods in dairies reach a higher standard, so will there be larger quantities of milk which may safely be sold for drinking in its best and natural state.

7. The value of separated milk used as a supplement to ordinary home diets is high, and country people should realize this, as a good deal of it to-day is wasted. Whey is rich in sugar and mineral elements and also contains significant amounts of protein and B and C vitamins. Like butter or cream, its proper place in a diet is to compensate for deficiencies in other forms of food; it would, for example, add considerably to the nutritional value of a diet containing cereals and cereal products.

8. The important pronouncements which we have quoted suggest strongly that those concerned in improving the national nutritional standard should concentrate attention in the first place on milk. There are equally strong arguments from the agricultural point of view for making an early and determined attack on the problem of achieving an increased consumption of this commodity. A large proportion of primary producers are getting only a bare living return for their labours, and, without the sale of more milk at the liquid milk price, are faced with the prospect of a prolonged period of increased difficulty. It is commonly known that about one-third of the existing milk supply is used

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for manufacture into butter, cheese, etc., and that a considerable proportion of this third could be taken for liquid consumption without serious detriment to the manufacturing industry, if practical means could be devised of disposing of it to those who need it. There are in existence schemes for the supply of free and cheap milk to children and nursing and expectant mothers under the Milk Act, 1934 (the Milk-in-Schools Scheme), the Education Act, 1921, and the Maternity and Child Welfare Act, 1918. The possibility of extending the facilities under these Acts should, we recommend, be carefully examined and consumption under them increased to the maximum. But the business of securing a really considerable increase in consumption throughout the community will be much more difficult. It is partly a problem of education and propaganda, but very largely a problem of price. Some reduction in price could undoubtedly be effected by improved efficiency in production and distribution, *particularly in the latter*, and we have noted with special interest the valuable comments on this subject by the Committee of Investigation for England in their recently published Report on Complaints, etc., as to the operation of the Milk Marketing Scheme, 1933. These matters, and the wider question as to whether the object could be assisted also by reasonable and justified modifications in the present price structure of the industry, are no doubt receiving the close attention of the Milk Reorganization Commission, whose report, we understand, is now expected to be available shortly.

We are glad to note that the Government has undertaken to conduct a comprehensive review of the whole milk and milk products situation when the report of the Reorganization Commission is available. (Answer to Parliamentary Question July 25, 1935.) The Standing Committee feels sure that the Council will attach the greatest importance to a determined attack on the liquid milk problem as an approach to the wider problems of nutrition and food production to which we referred at the beginning of this Report.

June 4, 1936.

APPENDIX II

Report from the Standing Committee of the Council of Agriculture for England on Housing of Rural Workers

1. At the last meeting of the Council (December 12, 1935) a resolution was adopted on the motion of the late Major F. H. Fawkes, seconded by Mr. G. E. Hewitt, as follows:—

“That the Standing Committee be asked to examine the existing situation as regards the powers of individual owners, local authorities and other bodies in respect of rural housing under the Housing Acts of 1926 and 1935, and the use made of those powers.”

The Standing Committee has accordingly made some examination of the position and finds it to be as set out hereunder.

2. The Minister of Health is the central authority in the administration of the Housing Acts, and has set up a Central Housing Advisory Committee, of which he himself is chairman. This Committee has appointed a Sub-Committee to advise solely on the question of Rural Housing, and this Sub-Committee will, no doubt, later deal with questions of policy as regards rural housing. The Standing Committee has, in the circumstances, thought it advisable to restrict this report principally to a statement of the facts of the position. The authorities dealing with the matter locally are the Councils for County Boroughs, Boroughs, and Urban and Rural Districts. The County Councils also possess certain limited powers.

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3. The Acts mainly concerned are the Housing Act, 1930, and the Housing Act, 1935. Under the former, houses which are deemed unfit for habitation are replaceable by new houses, in respect of which an Exchequer contribution is at present available and will continue at least up to March, 1938, when it comes up for review. This contribution is in the form of an annual payment for 40 years amounting to £2 10s. for *each person* rehoused from an agricultural parish. In addition, the local authority makes a contribution of £3 15s. annually for the same period for *each new house*, of which the County Council pays £1 annually for 40 years if the house is required for the agricultural population. This totals up to a considerable subsidy, and may easily in the case of moderately large families amount to a sum which if capitalized would almost equal the cost of the new house, so that the rent would only have to be sufficient to cover the cost of repairs, etc., plus the rates. 11,454 houses have already been built, or have been approved for construction, in rural districts under this Act of 1930. Typical rents range from 1s. 6d. to 3s. 6d. per week, exclusive of rates. In 1933, local authorities were asked to submit a five-year programme covering all the unfit houses in their areas. This they did and are now engaged in completing the programme by demolishing and replacing the unfit houses. The total number of unfit houses included in the programmes of Rural District Councils is 34,684.

4. The Act of 1935 provides a special subsidy from the Exchequer to Rural District Councils in respect of houses built by them to relieve overcrowding among the agricultural population. In such a case, the minimum contribution per house is £2 a year and the maximum £8 a year, for a period of 40 years, the exact amount being settled by the Ministry of Health on the advice of a special Rural Housing Committee appointed for the purpose. Contributions of £1 per house for 40 years are also required to be made both by the Rural District Council and the County Council. Local authorities are for the most part still engaged in surveying their areas to ascertain the extent of the overcrowding which they are to remedy. After their survey, proposals must be submitted to the Ministry of Health by August 1, 1936.

5. In order to understand the full position, however, it is necessary, in addition to the statement as to the situation under the Acts of 1930 and 1935, to have particulars of the requirements of earlier Acts which operate, some in regard to general housing and others in particular to rural housing. There is, for example, a statutory duty imposed by Section 1 of the Housing Act, 1925, on any landlord who lets a working-class house, to keep it in all respects fit for habitation during the tenancy. The local authority also has the duty laid upon it to inspect the district from time to time to ascertain the condition of houses and whether, in any particular case, an owner should be called upon to carry out necessary repairs at his own cost. The numbers of houses repaired as a result of action under this section during the year ended September 30, 1935, were 4,623 after service of formal notice subsequent to local authority inspection, and 13,937 after informal action subsequent to inspection. Minor defects relating to taps, drains, etc., are normally dealt with on similar lines under the Public Health Acts.

6. Other Acts coming under the heading of Housing (Rural Workers) Acts permit of the improvement of cottages lived in by agricultural workers and similar persons and for the conversion of other buildings into cottages. For these purposes grants may be made by the local authority to private landlords up to two-thirds of the cost of the works, subject to a maximum of £100 per house. Half such grant is repaid by the Exchequer. The conditions attached to grants ensure that the benefit

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goes to the tenant and not to the owner. The cottages so dealt with, moreover, have to be let to an agricultural labourer or similar person for at least 20 years at a rent not exceeding the normal agricultural rent of the district, increased by a sum equivalent to 4 per cent. of the owner's share of the cost of the improvement or conversion. Ordinary repair and maintenance works cannot be brought under this heading, and, in order to exclude them, the cost of the works for which a grant may be given must not be less than £50. These Acts have been useful in reconditioning and improving cottages which might otherwise have had to be demolished as unfit for human habitation, and should be equally useful in enlarging cottages which are found to be too small on the new standards for a family of normal size.

7. It is interesting to note that the recent Housing Act of 1935 makes provision for the payment of Exchequer grant in respect of cottages belonging to local authorities themselves, who are thus able to buy and improve cottages the owners of which may be unable or unwilling to carry out the improvements themselves.

8. Special stress must be laid on the fact that the Housing (Rural Workers) Acts are temporary only, and, unless extended, will expire in June, 1938.

9. A list of numbers of cottages in each county for which local authorities have undertaken to grant assistance in England is appended. The Standing Committee observes that there are very great variations in these figures. It is, in the Committee's view, unfortunate that there should be so much disparity between agricultural counties, as shown by these figures, and it urges strongly on all its members that they should be active on their Councils in going forward with improvements, so that the maximum advantage may be taken of the Acts before their expiry in June, 1938. The Committee is sure that members of the Council will agree that there can be no adequate cause for unsatisfactory housing conditions in rural districts being tolerated while the Acts empowering and assisting local authorities and owners to take necessary steps to remedy acknowledged evils, remain in operation.

10. Apart from the powers of local authorities under the Acts mentioned above, there are the permanent powers under Part III of the Housing Act, 1925, to build new houses and to control and manage them, charging such rents as the capital expenditure involved demands. There have also been the temporary Acts known as the Addison Act of 1919, the Chamberlain Act of 1923, and the Wheatley Act of 1924, which have enabled local authorities to build houses in rural and other districts, though, except for the agricultural subsidy under the Wheatley Act, owing to the high level of building prices at the time, the costs, notwithstanding the subsidies, were so high as to preclude the letting of cottages at agricultural rents. The Housing Act, 1935, provides for the pooling of the Exchequer and rate contributions for all houses belonging to local authorities no matter under what Act they were built and enables authorities to arrange the rents as they think fit. Under this arrangement, if the whole of the very high subsidy under the Act of 1930 is not needed for the houses built under that Act, part of it can be used to reduce the rents of other houses built under earlier Acts and bring them more within the reach of the agricultural population.

11. One further point should be mentioned, namely, that although the authority mostly concerned in housing in rural districts is the Rural District Council, the County Council has certain special responsibilities under the general Housing Act. It is, for example, its duty to have constant regard to housing conditions in rural districts and, where a formal complaint is made, or there is reason to think that a Rural District

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Council has failed in its duty, the County Council may hold a public inquiry, and, as a result, default the Rural District Council and take over its powers. There is no record of this drastic action having yet been taken in any particular case although in at least one case the County Council has taken the first step of holding an inquiry. There is also the general power for County Councils to make contributions of such amount as they think fit to Rural District Councils towards the cost of

HOUSING (RURAL WORKERS) ACTS.

Assistance by Way of Grants and Loans.

Conversions and Improvements in English Counties.

March 31, 1936

In the following Counties the C.C.'s are the local authorities for the pur- poses of the Acts	Total No. of Houses	In the following Counties the R.D.C.'s are the local authorities for the pur- poses of the Acts	Total No. of Houses
Bedford	—	Berks	206
Chester	157	Bucks	44
Cumberland	586	Cambridge	110
Derby (part)	27	Cornwall	514
Devon	1,446	Derby (part)	7
Dorset	156	Durham	230
Ely, Isle of	16	Gloucester (part)	96
Essex	618	Hereford	148
Gloucester (part)	43	Hertford	23
Huntingdon	51	Lincs (Kesteven)	221
Kent	150	(Lindsey) (part)	134
Lancaster	22	Norfolk	478
Leicester	38	Northumberland	180
Lincoln (Holland)	—	Peterborough, Soke of	4
(Lindsey) (part)	127	Salop	615
Northampton	133	Somerset (part)	10
Nottingham	161	Warwick	139
Oxford	326	Wight, Isle of	—
Rutland	44		
Somerset (part)	306		
Southampton	516		
Stafford	84		
Suffolk East	784		
" West	39		
Surrey	27		
Sussex East	85		
" West	70		
Westmorland	37		
Worcester	386		
Wilts	410		
Yorks, East Riding	24		
" North	153		
" West	75		
GRAND TOTAL ..	7,097	GRAND TOTAL ..	3,159

COUNCIL OF AGRICULTURE FOR ENGLAND

providing houses in the district. That power is in addition to the County Council obligation to contribute £1 per house for 40 years towards houses required for the agricultural population to replace unfit houses or to relieve overcrowding.

12. In presenting this Report, which is one mainly of statement of fact, the Standing Committee desires to stress its conviction of the importance of good housing conditions in rural districts. The agricultural labourer is not in a position to pay anything but a low rent: that is generally acknowledged and agreed; and most landowners and farmers who own cottages do in fact do their utmost to accommodate him cheaply. But this position should not be held to justify a tolerance of inadequate or unsanitary conditions. Overcrowding in urban areas is a matter which is being taken up by urban authorities as one of urgent public importance. The overcrowding of individual cottages by agricultural workers and their families in rural districts should be taken up equally strongly by Rural District Councils, who should make the fullest use of their powers to help owners to render their cottages satisfactory, or the Council should provide cottages themselves. No petty considerations such as a reluctance to make grants to landowners and persons of means should be allowed to stand in the way. They are not really relevant as the Acts provide the means stated above to deal with the problem, and all should co-operate to use that means to the full while it is available. It should be remembered, also, in this connexion, that the Acts take pains to ensure that the benefit of any grants goes to the occupant and not to the landlord.

May 12, 1936.

APPENDIX III

Report from the Standing Committee of the Council of Agriculture for England on the Need for Uniformity in County Administration of the Milk and Dairies Order, 1926, and the Milk (Special Designations) Order, 1936

1. In connexion with its consideration of the new Milk (Special Designations) Order, 1936, dated April 18, 1936, and made by the Ministry of Health, the Standing Committee has had its attention drawn to the fact that there is very considerable lack of uniformity amongst county and other local authorities in the administration of the regulations controlling dairy farms and the production of milk. The duties of the local authority include the inspection of farm buildings, cows, equipment and methods of milking. These sometimes involve inspection by officers from different departments of the same local authority or from different local authorities within the same county, and where great care is not taken in co-ordinating control, differences and anomalies are found to occur in official requirements even in the same county. Incidentally, it appears to be clear that in those counties in which whole-time veterinary staffs have been established, the duties of the various authorities are carried out with less difficulty and greater efficiency than in others, because of the general supervision which is in practice exercised by those staffs.

2. As regards the conditions necessary for clean milk production, it seems to be agreed by all authorities that model farm buildings are not essential. The cleanest milk can be produced in cowsheds of quite ordinary character, providing correct methods of clean milk production are known and employed by the milkers. The requirements of the Milk and Dairies Order, 1926, if duly observed, would probably prove fully sufficient for the purpose.

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3. Within recent months, the question of uniformity in the administration of Milk Orders has been brought into greater prominence through the desire of so many dairy farmers to obtain Grade A licences and so qualify as Accredited Producers with the Milk Marketing Board. These licences are issued by the County Clerk on the advice of the Medical Officer of Health, who, on reports made to him or by inspection from his own Department, is satisfied that all the prescribed requirements have been fulfilled. The licences continue in operation so long as the conditions on the farm remain satisfactory and the milk continues to reach the required standard.

4. The Standing Committee is glad to note that the County Councils' Association has exercised, and is exercising, a useful influence in this matter. It has issued a memorandum on it, for the information of County Councils and their officials, with a view to bringing about greater uniformity.

5. The Farmers' Club has also considered the matter in detail, and a note on the paper read on March 30, 1936, by Mr. J. Mackintosh, of the National Institute for Research in Dairying, Reading, has been published in the Club Journal. In that paper, it was suggested that one method of remedying the lack of uniformity would be the issue of Orders from the Ministries of Health and Agriculture with explicit definitions and instructions. It was suggested that by this method uniformity would be reached in such matters as the best procedure for sampling milk and the right kind of equipment for cooling and sterilizing; though it was recognized that such instructions could not be applied to the question of construction and equipment of cowsheds, because local conditions throughout the country varied so greatly. With this view as to variation of local conditions and their effects, the Standing Committee agrees, as it considers it easy to make mistakes by requiring a too rigid adherence to one particular type of cowshed or cowshed fitment. So long as there is ample light and ventilation, an impervious floor, and good manure channels to assist general sanitation and cleanliness, the main basic conditions for clean milk production will be present. The need for a good water supply for cleaning cowsheds, washing utensils, and cooling the milk goes almost without saying; and the Milk Marketing Board contracts require cooling to 60° F. immediately after milking.

6. On the general suggestion that the Ministries of Health and Agriculture should issue Orders, however, the Standing Committee considers that it would be best to leave it in abeyance for the present to see whether the propaganda already set on foot will or will not be effective. The circular letter of the Ministry of Health, dated April 18, 1936, to Town and County Clerks, sending them a copy of the Milk (Special Designations) Order, 1936, not only fully explains the new Order, but deals with certain matters which are fundamental to the proper observance of the conditions of the Milk Orders, including this question of uniformity. It is hoped, therefore that the subject has been given sufficient prominence already, and that local authorities will now see their way to take such steps as will ensure a full measure of co-operation between them and their officials, and thus bring about that uniformity of methods and standards in their respective areas which is so much to be desired in the interests of all concerned in the industry of milk production.

May 12, 1936.

JULY ON THE FARM

E. J. ROBERTS, M.A., M.Sc.,

WHEN weather conditions for haymaking have been favourable, there is an interval in the latter part of July between the hay and the corn harvest; in the North this is later and extends into August. This interval may be used for hoeing, harvesting early potatoes, bracken cutting, clearing ditches, etc. The clearing of ditches is important work that should be carried out at this time of the year because, owing to the small amount of water, the work can be carried out rapidly and cheaply. Most of this work is undertaken by the various Catchment Boards, and their men may be seen at work in many parts of the country. On farms where the smaller water-courses contain quantities of the fresh-water snail that is responsible for liver fluke in sheep, and where the ditches are apt to flood some of the land in winter, farmers should consider the advisability of dusting with sulphate of copper when the water is low. Prevention is better than cure, and a few danger points may well be tackled in this way. A few years ago farmers on a low-lying area in North Wales, where heavy losses from fluke had been sustained, worked in conjunction with the estate authorities and the advisory veterinary research officer for the area in order to buy a bulk supply of bluestone and to treat all infested ditches.

Weeds. Weed control is important on all types of farms, and the illustrated leaflets issued by the Ministry of Agriculture help this work; these publications not only give advice on eradication, but, by describing the life histories of the weeds, aid in an intelligent application of the various control measures under different conditions of weather and soil.

The action of the Scottish Department of Agriculture in giving grants for bracken eradication draws attention to the importance of this weed. Its destruction was fully dealt with in these notes last year.* Bracken, unlike thistles, can be eradicated by cutting. If cutting once a year is carried out, the middle of July is the best time. In Caernarvonshire,

* This JOURNAL, June, 1935 (p. 283), and July, 1935 (p. 398).

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there is a tradition that bracken cut on St. Swithin's Day will not grow again.

Nettles are an unsightly and troublesome weed in some grass land. This weed thrives on good land, particularly if the soil is loose; if consolidation of the soil by treading can be encouraged, such as by putting the feeding troughs near the nettle-infested patches, eradication follows quickly upon cutting. Again, pigs may be used very effectively for dealing with nettles; at certain times of the year, particularly in late autumn, pigs will grub up and eat every particle of nettle roots. Another effective method of treatment is by dusting with sodium chlorate.

Pastures. The growth of herbage is usually small this month. This is generally said to be due to the lower rainfall and to a natural falling off after the peak period of May or June. Many, however, think that the lower production in July and August and the increase afterwards in late summer is not due to rainfall, but represents a state of temporary exhaustion, followed by a small recovery before the winter.

Wild white clover becomes very prominent in many pastures in July. In recent years some have dared to raise their voices against this constituent of good pastures. In Scotland many hold the view that this clover is responsible for scouring in lambs. In grazing trials carried out in North Wales, more scouring was observed in some years on the wild white pasture than on the field with less of this constituent. The scouring, however, was not serious and was confined to ewes and young cattle; no difference was observed in the lambs. In Scotland, wild white clover is often blamed for causing "bloat" or "hoven" in cattle. Dr. McCandlish, West of Scotland College of Agriculture, is carrying out interesting experimental work to discover whether some strains of this clover are more apt to cause hoven than others. In many parts of Cheshire, dairy farmers regard this clover with disfavour and blame it for the drop in the yield of milk that occurs at this time of year. This aspect has been dealt with in this JOURNAL (Sept., 1935) by Principal Mercer, who regarded the small bulk of fodder contributed by this clover as one (though not the chief) cause of the complaint that the appearance of the clover bloom coincided with a drop in the milk yield.

JULY ON THE FARM

The stocking of pastures is often a difficult matter this month. If the season has been favourable in April and May, and the pastures have been adequately stocked with cattle to cope with the grass, a dry July means much selling off. Where grass flocks are maintained, the difficulty is less; the lambs, in numbers and weight, are about their maximum at the time of rapid grass growth, and the sale of fat lambs follows closely the decrease in the productivity of the turf. Again, with good growing conditions during this month, the grazier is often in an awkward dilemma; it is very difficult, if not impossible, to buy any stock in July that will be worth more money in early autumn.

Many pastures cannot be adequately grazed at this time of year owing to the lack of a good water supply. Where stock have to drink from ditches, graziers should be on their guard against pollution, particularly if houses have been recently built in the neighbourhood. The effluent from properly functioning septic tanks should be pure and should cause no harm. Pollution is, however, possible because, for instance, the liberal use of disinfectants by housewives for cleansing sinks, etc., may interfere with the bacterial process of purification. Pollution is more likely to occur from "cess-pits" that are not provided with a second chamber for cinders. A grazier recently suffered heavy losses through all his cattle becoming wasters. Though it could not be proved sufficiently clearly to take to a court of law, it was considered that the losses were probably caused by pollution of the water supply by the effluent from a badly-functioning sewage system of a nearby school. An analysis of the water failed to prove this, but sample bottles of this water that had been retained corked up for some weeks "popped" when uncorked, giving a strong sulphurous smell. In the words of one grazier, "science or no science, it was not the sort of water that cattle should be drinking." The owner attributed the loss more to the cattle refusing to drink sufficient water than to direct damage by the water. There is the consolation, however, that where there is building there is also a water main.

Diseases of Cereals. The unfavourable growing conditions in April and May may, perhaps, cause heavier losses from certain diseases, such as Leaf Stripe of oats and Foot-rot of wheat. The former is seed-borne, and can be controlled by the various dusting preparations; results of experiments

JULY ON THE FARM

indicate that it is in years such as this that the greatest benefit is to be obtained from treatment of the seed.

Foot-rot in wheat is caused by types of moulds, mainly *Fusarium* and *Ophiobolus*, that infect mostly from the soil, attacking the roots and underground parts of the stem. It is believed to be more serious where wheat comes frequently in the rotation, and occurs abroad as well as in this country; it is more prevalent in the Eastern than the Western Counties of England. It does not necessarily follow the continuous growing of wheat; an observer notes that the disease is absent from some fields in Canada where wheat has been grown continuously for over 30 years. The symptoms of the disease vary according to the stage of growth of the crop. At this period of the year it may cause White-heads, which is seen after flowering and when the crop is still green; the straw is apt to crumble when crushed in the hand. In the *New Zealand Journal of Agriculture* (March, 1936) it is stated that the disease can exist on ryegrass and on couch. Dr. Sanders in a paper read at the Conference on Mechanized Farming, at Oxford, January, 1936, took a serious view of the incidence of Foot-rot.

For Young Farmers. A large proportion of the country's grass lambs will be marketed this month, and buyers are more discriminating than in the previous months. With the increased numbers of home-produced grass lambs, and the raising of the quality of the imported lambs, quality is assuming greater importance in our markets. The type of lamb that realizes the best price per lb. is the one giving, at an early age, a compact carcass with a good proportion of meat on the most expensive cuts. Sires of Down breeds, such as the Southdown, impart the compactness of frame, while ewes of the Mountain breeds, or half-bred mountain breeds, give the lamb the large milk supply essential for early maturity. It may be mentioned that the growing demand for lambs giving carcasses not exceeding 32 lb. is likely to favour the use of ewes of a small breed, such as the Welsh Mountain, mated to a tup of the same kind.

A grass lamb was followed to the abattoir, and subsequently to the counter, in order to see how it "cut up." The carcass weighed 35 lb. immediately after slaughter, and 34 lb. in the shop the following day, each side weighing 17 lb. One side

JULY ON THE FARM

was cut into large portions, as would be required by those catering for a family; the result was as follows:—

			<i>lb. oz.</i>		<i>s. d.</i>			<i>£ s. d.</i>
Leg of Lamb	..	..	5 0	@	1 4	per lb.	..	0 6 8
Loin	..	..	3 8	@	1 4	„	..	0 4 8
Shoulder	..	..	3 9	@	1 4	„	..	0 4 9
Neck	..	..	3 8	@	1 0	„	..	0 3 6
Breast	..	..	1 5	@	0 10	„	..	0 1 0
			<hr/>					
			16	14				
			<hr/>					
								£1 0 7
			<hr/>					<hr/>

(20z. lost in cutting and weighing.)

Thus, 12 lb. 1 oz. of the more expensive cuts and 4 lb. 13 oz. of the less expensive cuts were obtained.

The other side was cut into smaller joints, such as would be required by small buyers; the shoulder, for instance, was divided into the knuckle end and blade end. The loss in cutting and weighing this side amounted to 6 oz. Incidentally, a "profit" of 54·3 per cent. was obtained from the carcass, assuming that the offals (which realized 3s. 4d.) paid the expenses of buying and slaughter. Another point of interest that comes to light is the high price obtained from the cheapest cuts; in this instance, no part of the lamb realized less than 10d. per lb.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended June 3rd.				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:					
Neutral (N. 20.6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium Cyanamide (N. 20.6%) ..	7 5e	7 5e	7 5e	7 5e	7 0
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	4 18	4 15	4 13	4 15	3 2
" " (Pot. 20%) ..	3 15	3 12	3 10	3 12	3 7
Muriate of Potash (Pot. 50%) ..	7 18	7 16	7 12	7 16	3 1
Sulphate " (Pot. 48%) ..	9 8	9 6	9 2	9 6	3 10
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
" (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½% P.A. 20½%) ..	..	6 17	6 5h	6 0	..
Steamed Bone Flour (N. ½% P.A. 27½—29½%) ..	5 12	5 10	5 2h	5 2	..

Abbreviations: N. = Nitrogen; P.A. = Phosphoric Acid;
S.P.A. = Soluble Phosphoric Acid; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

‡ Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

§ Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

¶ For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

¶ Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb. so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertiliser be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures" obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Protein and Meat Production. From the scientific point of view, meat production is the result of a complex series of chemical processes within the animal body, ending in the production of two quite distinct materials—protein and fat. The former predominates in the “lean” part of the meat and the latter in the “fat.” Using the term in its popular sense, “meat” thus consists of a more or less intimate mixture of water, proteins and fat.

The protein of meat, which corresponds roughly to the “lean,” can only be produced out of the protein ingredients of the food, whereas the fat can be produced out of either protein, oil or carbohydrates supplied in the food. Hence any digestible ration if given liberally will produce fat, but whether it will at the same time produce any “lean” will depend upon the amount of digestible protein (surplus to the maintenance requirement) in the ration. In so far, therefore, as the proportion of “lean” to fat is determined by the food supply, it is essentially a question of the balance of proteins to non-protein ingredients in the ration.

Either a deficiency of protein or an excess of non-proteins will result in a low ratio of lean to fat. Whether a liberal supply of protein will produce more “lean” in the carcass depends partly upon the proportion of non-proteins by which it is accompanied in the ration, and partly upon the inherent capacity of the animal to convert food protein into meat protein.

Within the limits imposed by the latter condition, and provided that the supply of oil and carbohydrates in the ration is adequate to cover the general maintenance needs of the animal, increase of protein in the ration should produce more lean tissue in the body.

The dominant factor, however, which determines the extent to which lean tissue can be produced in the animal is its inherited capacity for growth. That individual animals show great differences in this capacity is common knowledge and underlies the breeder's work of mating and selection for

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meat-production qualities. Each animal is born with its specific capacity to make growth (lean tissue, bone, blood) and it is the business of feeding and management to secure that this capacity is fully utilized up to the point at which the animal is ready for sale, whilst at the same time securing that the *growth* is accompanied by just sufficient fat-production to give the particular balance of lean to fat that is desired in the carcass.

For purposes of discussion, it is convenient to treat growth and fattening as if they were entirely separate processes, but in the practical feeding of the growing animal the growth proper is always accompanied by a certain amount of fat production. In the earlier stages, when the growth impulse is still strong, the live-weight increase of the animal is primarily a growth increase and only to a relatively small extent due to deposition of fat. As the animal ages and the intensity of the growth impulse decreases the increase of live-weight becomes more and more a matter of fattening and less of growth, until eventually when the animal is fully "grown" any further increase of live-weight can only be due to deposition of fat.

These changes are well illustrated by experimental data on the composition of the live-weight increase of animals at different stages of development. Thus in one set of experiments the live-weight increase put on by pigs in the first 17 days after birth was found to contain 79 per cent. water, 17 per cent. protein and 2 per cent. each of fat and mineral matters. In another set of experiments in which the pigs were fed from 63 days old for 114 days, the corresponding figures for the composition of the live-weight increase were—water 44 per cent., protein 9 per cent., fat 44 per cent., and mineral matters 3 per cent. Lastly, with the full-grown fat pig Lawes and Gilbert found the live-weight increase to consist of 22 per cent. water, $6\frac{1}{2}$ per cent. protein and $71\frac{1}{2}$ per cent. fat. With extremely fat adult sheep the increase put on in the final stage of fattening has been found to contain nearly 92 per cent. of fat, along with less than 2 per cent. of protein.

These data bring out clearly the further fact that live-weight increase is a very uncertain measure of food requirement, since in the early stages the "increase" may contain nearly 80 per cent. of water, whereas in the final stages of fattening this may have fallen to 20 per cent. or less. Further, the dry substance of the "increase" in the early

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stages is mainly protein, whilst in the later stages it is mainly fat and, therefore, more concentrated. Measured in terms of energy, 1 lb. of "increase" in the adult animal is fully six times as concentrated as in the very young animal. This is reflected in the familiar practical observation that the quantity of food required to give a particular amount of live-weight increase steadily rises as the animal advances in age.

What we are more particularly concerned to note here is the dominant part played by protein in the earlier stages of growth, and its steadily falling significance with advancing age. Clearly we may expect to find that any chance of influencing growth (and, therefore the production of lean tissue) by liberal supply of protein in the food will be greatest in the early stages of growth and will tend to disappear when the growth activities of the animal fall behind those devoted to fattening.

If we compare the amounts of protein retained in the body of the growing animal at different live-weights in terms of a common live-weight, say per 100 lb. live-weight, we find that the protein storage falls very rapidly in the early months and then more and more slowly as the animal gets older. Thus a calf 115 days old will store daily about 1 lb. protein per 1,000 lb. live-weight, whilst at 250 days old it will store daily only about 0.5 lb. protein per 1,000 lb. live-weight. The amount of food protein that will secure the maximum amount of protein storage may be regarded as the optimum supply, and any increase beyond this amount is unlikely on the average to produce any appreciable further storage of protein. Thus in German experiments with calves the amount of protein stored in the body remained unchanged at five different levels of protein supply, ranging from 1.3 to 3.3 lb. digestible true protein per 1,000 lb. live-weight, the excess nitrogen being simply voided in the urine. Only when the protein supply was reduced to 1.1 lb. did a fall in protein storage occur.

The conditions are much the same with the pig except that the rate of protein storage (per 1,000 lb. live-weight) is higher at the start and falls more quickly, as is to be expected in view of the more rapid growth-rate of the pig.

The amount of protein retained by the animal clearly represents the minimum amount of digestible protein that must be supplied in its food (in addition to the maintenance protein requirement), but it is very unlikely that this 100 per

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cent. efficiency of conversion of food protein into body protein can be attained in practice. The nearest approach will be with the young suckling animal living entirely on milk. In other diets the "biological value" of the protein will be less, and probably ranges in good practical rations from 50 to 80 per cent. of that of milk. In other words, it will commonly be necessary to include in the "production" food 20 to 50 per cent. more digestible protein than is retained by the animal. (In this connexion it is of interest to note that the protein standard commonly used in the rationing of dairy cows requires that the food shall contain about 70 per cent. more digestible protein than is secreted in the milk produced from it.)

For growing cattle, assuming a maintenance requirement of 0.6 lb. digestible protein per 1,000 lb. live-weight, and a biological efficiency of 70 per cent. for the food protein, Mollgaard arrives at the following optimum standards:—

<i>Age Months</i>	<i>Live-weight lb.</i>		<i>Digestible Protein per 1,000 lb. Live-wt. lb.</i>
	<i>kg.</i>	<i>approx.</i>	
2-3	70	154	2.45
3-6	140	308	1.73
6-12	240	529	1.21
12-18	320	705	0.98
18-24	400	881	0.87

Protein standards for pigs must be on a relatively higher scale than for calves, especially in the first 3 or 4 months, in view of the more rapid growth of the pig. Unfortunately there are very few precise data available for either the maintenance or production protein requirements of the pig, the standards in use being mostly derived from practical feeding experiments in which the effects have been measured by changes in live-weight that included both growth and fattening. From a survey of the best of these, along with the few nitrogen balance data available, the following table is suggested for the optimum protein requirements of the growing pig:—

<i>Live-weight lb.</i>	<i>Digestible Protein per head per day lb.</i>	<i>Live-weight lb.</i>	<i>Digestible Protein per head per day lb.</i>
30	0.29	130	0.55
50	0.37	150	0.56
70	0.44	170	0.57
90	0.50	190	0.58
110	0.53	210	0.59

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From these standards one may deduce, for example, that the ration of the 30 lb. pig eating $1\frac{1}{4}$ lb. of food daily should contain 17 per cent. of digestible protein; whereas at 110 lb., consuming $4\frac{1}{2}$ lb. food, the ration need contain only 11.8 per cent. digestible protein; and at 210 lb., consuming 6 lb. daily, 9.8 per cent. digestible protein. There is certainly no reliable evidence that the supply of greater amounts of protein than these will lead to greater protein storage, and therefore, more lean meat in the body.

It must also be borne in mind that these standards postulate that the pig is making a very good rate of growth; if the growth rate is less satisfactory the protein supply may be reduced accordingly without any sacrifice of efficiency at the level of production that is actually being secured. For the slower growing pig the standards can probably be reduced by 25 per cent. up to 110-130 lb. live-weight.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	6 18	0 8	6 10	72	1 10	0.98	9.6
Barley, British feeding ..	5 10	0 8	5 2	71	1 5	0.76	6.2
" Persian	5 0*	0 8	4 12	71	1 4	0.71	6.2
" Polish	5 17	0 8	5 9	71	1 6	0.80	6.2
" Russian	6 0	0 8	5 12	71	1 7	0.85	6.2
Oats, English, white ..	6 7	0 9	5 18	60	2 0	1.07	7.6
" " black and grey	6 7	0 9	5 18	60	2 0	1.07	7.6
" Scotch, white ..	6 13	0 9	6 4	60	2 1	1.12	7.6
" Canadian, No. 3 Western	6 5†	0 9	5 16	60	1 11	1.03	7.6
" Canadian mixed feed	5 8†	0 9	4 19	60	1 8	0.89	7.6
Maize, Argentine	4 15	0 7	4 8	78	1 2	0.62	7.6
" Danubian Gal. Fox South African, No. 2 White Flat	4 10†	0 7	4 3	78	1 1	0.58	7.6
Beans, English, Winter	4 12†	0 7	4 5	78	1 1	0.58	7.6
Peas, Japanese	5 10§	0 17	4 13	66	1 5	0.76	19.7
Dari	16 5†	0 15	15 10	69	4 6	2.41	18.1
Milling Offals :—	6 15†	0 8	6 7	74	1 9	0.94	7.2
Bran, British	5 2	0 15	4 7	43	2 0	1.07	9.9
" broad	5 17	0 15	5 2	43	2 4	1.25	10
Middlings, fine, imported	5 15	0 13	5 2	69	1 6	0.80	12.1
Weatings†	5 12	0 14	4 18	56	1 9	0.94	10.7
" Superfine†	6 5	0 13	5 12	69	1 7	0.85	12.1
Pollards, imported ..	5 2	0 14	4 8	50	1 9	0.94	11
Meal, barley	7 2	0 8	6 14	71	1 11	1.03	6.2
" " grade II	6 7	0 8	5 19	71	1 8	0.89	6.2
" maize	5 7	0 7	5 0	78	1 3	0.67	7.6
" " (S. African)	5 2	0 7	4 15	78	1 3	0.67	7.6
" " germ	5 7	0 11	4 16	84	1 2	0.62	10.3
" locust bean	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean	8 0	0 17	7 3	66	2 2	1.16	19.7
" fish (white)	13 5	2 2	11 3	59	3 9	2.01	53
Maize, cooked, flaked ..	5 17	0 7	5 10	84	1 4	0.71	9.2
" gluten feed	5 7	0 13	4 14	76	1 3	0.67	19.2
Linseed cake—							
English, 12% oil ..	8 2	1 0	7 2	74	1 11	1.03	24.6
" 9% "	7 12	1 0	6 12	74	1 9	0.94	24.6
" 8% "	7 7	1 0	6 7	74	1 9	0.94	24.6
" 6% "	7 12§	1 0	6 12	74	1 9	0.94	24.6
Soya-bean cake, 5½% oil	8 5§	1 8	6 17	69	2 0	1.07	36.9
Cottonseed cake,							
English, Egyptian seed, 4½% oil	4 12	0 18	3 14	42	1 9	0.94	17.3
Cottonseed cake, Egyptian, 4½% oil ..	4 6	0 18	3 8	42	1 7	0.85	17.3

PRICES OF FEEDING STUFFS *(continued)*

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Cottonseed cake, decorticated, 7% oil ..	6 17†	1 8	5 9	68	1 7	0.85	34.7
Cottonseed meal, decorticated, 7% oil ..	6 17†	1 8	5 9	70	1 7	0.85	36.8
Coconut cake, 6% oil ..	6 2	0 18	5 4	77	1 4	0.71	16.4
Ground nut cake, 6-7% oil	6 0*	0 18	5 2	57	1 9	0.94	27.3
Ground nut cake, decorticated, 6-7% oil	7 5	1 8	5 17	73	1 7	0.85	41.3
Ground nut cake, imported decorticated, 6-7% oil	6 10	1 8	5 2	73	1 5	0.76	41.3
Palm-kernel cake, 4½-5½% oil	6 5†	0 12	5 13	73	1 7	0.85	16.9
Palm-kernel cake meal, 4½% oil	6 2†	0 12	5 10	73	1 6	0.80	16.9
Palm-kernel meal, 1-2% oil	5 7	0 12	4 15	71	1 4	0.71	16.5
Feeding treacle	4 12	0 8	4 4	51	1 8	0.89	2.7
Brewers' grains, dried	4 10	0 11	3 19	48	1 8	0.89	12.5
Brewers grains, dried porter	4 2	0 11	3 11	48	1 6	0.80	12.5
Dried sugar-beet pulp (a)	5 12	0 5	5 7	66	1 7	0.85	5.2

(a) Carriage paid in 5 ton lots. * At Bristol. § At Hull. † At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of May, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £9 per ton, then, since its manurial value is £1 per ton as shown above, the cost of food value per ton is £8. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22.4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton, are calculated on the basis of the following unit prices:—N., 7s. 3d.; P₂O₅, 2s. 3d.; K₂O 3s. 5d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	5 12
Maize	78	7.6	4 15
Decorticated ground-nut cake	73	41.3	6 17
" cotton-seed cake	68	34.7	6 17
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1.41 shillings, and per unit protein equivalent, 1.26 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 14
Oats	60	7.6	4 14
Barley	71	6.2	5 8
Potatoes	18	0.8	1 6
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 10
Beans	66	19.7	5 18
Good meadow hay	37	4.6	2 18
Good oat straw	20	0.9	1 9
Good clover hay	38	7.0	3 2
Vetch and oat silage ..	13	1.6	1 0
Barley straw	23	0.7	1 13
Wheat straw	13	0.1	0 18
Bean straw	23	1.7	1 15

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Farm Institute Live Stock Judging Competition

THE annual Live Stock Judging Competition, open to teams of three from Farm Institutes in England and Wales, was held at the farm of Mr. Milton Harris, Little Milton Manor, near Oxford, on Friday, June 5, 1936. This was the tenth occasion on which the competition has been held, and teams from the following counties competed: Cumberland and Westmorland (Newton Rigg), Cheshire (Reaseheath), Hampshire (Sparsholt), Hertfordshire (Oaklands), Monmouthshire (Usk), Northamptonshire (Moulton), Staffordshire (Rodbaston) and East Sussex (Plumpton).

The teams were required to judge Dairy Shorthorn Cows, Shire Horses, Large White First-cross Pigs for bacon, Hampshire Down Sheep for the butcher, and Rhode Island Red Poultry. The stock was very good and interesting. The competitors were very successful except as regards the horses, which, though a fine lot of animals, proved to be a difficult class. The following judges officiated:—

Dairy Cows	..	..	..	..	Mr. R. Hobbs.
Horses	..	..	..	..	Mr. T. H. Freshney
Sheep	..	..	..	..	Mr. F. T. Whitlock.
Pigs	..	..	..	..	Mr. F. H. Gale.
Poultry	..	..	..	..	Miss M. C. Graham.

The judges gave the reasons for their awards, and this served as a very useful demonstration.

The team from Cumberland and Westmorland were the winners, with a score of 274 marks out of a possible 365. The Staffordshire team were second, with 250 marks.

The competition was followed by a luncheon, presided over by Mr. G. Gibbard, Vice-President of the National Farmers' Union, who presented the Challenge Cup to the winning team.

Trials of Potatoes for Immunity from Wart Disease, 1935

THE trials which are arranged each year by the Ministry with the object of testing new varieties of potatoes for immunity from Wart Disease, were again conducted in 1935 on the farm of the National Institute of Agricultural Botany, Ormskirk, Lancashire. The actual field operations and the taking of records were carried out by Mr. Harold Bryan, B.Sc., and Mrs. McDermott, of the Institute, but the trials were conducted on a plan approved by the Ministry.

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Fifty-two stocks were included in the second and subsequent years' tests, none of which developed Wart Disease. Of the 36 entries for the first year's tests, 11 became infected in the field; 4 proved to be synonyms of existing varieties; 4 were too poor or too mixed to judge, and 28 were distinct varieties.

As in previous years, the results of the trials have been considered by a small committee composed of representatives of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland, and co-ordinated with the results of the trials carried out by the two last-named Departments at Edinburgh and Kilkeel respectively.

The Committee recommended the approval of 33 new varieties, but none of these has actually been added to the approved list, inclusion having been postponed until such time as the raisers intimate that the varieties have actually been or will shortly be introduced into commerce. This intimation has been received in respect of three varieties which had been recommended for approval as the result of trials carried out in previous years and which are now being introduced into commerce: descriptions of these varieties are given below.

The findings of the Potato Synonym Committee of the National Institute of Agricultural Botany have been accepted by the Ministry where recommendations as to the classification of new varieties as synonymous with existing varieties have been made by that Committee.

A list of the names of the more commonly grown varieties which have been approved as immune from Wart Disease may be obtained on application to the Ministry.

EARLY VARIETY.

Angus Leader

<i>Sprout</i>	Pink.
<i>Tuber.</i>	Kidney; skin white; flesh pale lemon; eyes shallow.
<i>Haulm and</i>	Medium height, spreading; stems branching; leaf
<i>Foliage.</i>	open and rigid; leaflets large, medium green; secondary leaflets small.
<i>Flowers.</i>	Flower stalks short; buds slightly green and drop off unopened.

LATE MAINCROP VARIETIES.

Arran Peak

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Oval, thick; skin yellow-netted; flesh white; eyes shallow to medium.

MISCELLANEOUS NOTES

Haulm and Foliage. Medium height, spreading ; stems strong, mottled red-purple ; wings broad and slightly wavy ; leaf open and graceful, mid-rib slightly tinged purple at base and at bases of leaflet stalk ; leaflet dark-green, dull, leaflet stalks long ; secondary leaflets often borne on the leaflet stalks.

Flowers. White, large and profuse, backs of flowers sometimes tinged purple ; buds large and dark.

Glen Clova

Sprout. Pink.

Tuber. Oval ; skin white ; flesh white ; eyes shallow.

Haulm and Foliage. Medium height, spreading ; light green colour ; leaf close, drooping ; leaflets fairly large, flat, terminal leaflet to the perpendicular ; secondary leaflets large and numerous ; wings slightly serrated ; main stem thick, faint mottling general towards maturity.

Flowers. White, numerous, clustered ; orange anthers.

The Agricultural Index Number

THE May general index number of the prices of agricultural produce at 115 (base 1911-13=100) is 4 points higher than that recorded in May last year, and the seasonal fall as compared with April is the same as in 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the period under review becomes 120.) Wheat, barley, oats, fat cattle, bacon pigs, eggs and potatoes were the principal commodities used in compiling the general index which showed rises above April price levels. Fat sheep, porkers, butter and milk declined.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	—
July	121	106	101	114	114	—
August	121	105	105	119	113	—
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

MISCELLANEOUS NOTES

Grain. Wheat, at an average of 6s. 9d. per cwt., was higher by 4d., but, owing to a more pronounced increase having taken place during the base period, the index is reduced by 1 point to 84. (The addition of "deficiency payments" under the Wheat Act, 1932 raises the index to 117.) Barley at 8s. 1d. and oats at 6s. 1d. per cwt. also advanced in value, the former by 9d. and the latter by 1d. per cwt. The index for barley moves upwards from 96 to 105, but that for oats shows a decline of 3 points to 82, again owing to the base movement having been out of harmony. In May, 1935, wheat averaged 5s. 4d., barley 7s., and oats 7s. 2d. per cwt., the respective indices being 67, 91 and 97.

Live Stock. At 34s. 9d. per live cwt. the average for second quality fat cattle recorded an increase of 1s. on the month, the index rising from 92 to 94. The effect of adding the cattle subsidy would make the index 107. Quotations for fat sheep at 9½d. per lb. for second quality showed a reduction of ½d., but as the drop in the base price was proportionately larger the index appreciated by 2 points to 130. Baconers averaged 11s. 2d. per score (20 lb.), or 1d. more than in April, the index at 113 being higher by 2 points, while porkers, at 11s. 4d. per score, decline in value by 6d., and in the index by 4 points to 108.

Compared with the preceding month dairy cows and store cattle were somewhat dearer, the relative indices moving from 100 to 101 and 94 to 96. On the other hand, store sheep and pigs were lower in price, the index for the former falling by 2 points to 107, and that for the latter by 4 points to 118.

Dairy and Poultry Produce. The fall of 4d. per gal. to the summer price for milk has led to a heavy drop in the index from 215 in April to 162. Butter declined by 1½d. per lb., but the index is unchanged at 96 owing to a similar reduction in the base period. The May average price for eggs was slightly higher than in April, and this was reflected in a rise in the index of 2 points to 109. Cheese was unchanged in value, but, with a lowering of prices during the base period, the index at 103 shows an advance of 3 points. A like movement during 1911-13 is responsible for the increase of 6 points in the combined index of poultry, average quotations for which were little altered.

Other Commodities. Prices for potatoes appreciated to a small extent, and this, taken in conjunction with a reverse

MISCELLANEOUS NOTES

movement having operated between the corresponding months of 1911-13, resulted in the index at 174 being 10 points higher than in April. Quotations for both varieties of hay were maintained at about the previous month's levels, but the combined index has risen by 3 points to 82. Wool at 1s. 0½d. per lb. was reduced in price by ½d., and the index by 1 point.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	May	May	Feb.	Mar.	Apr.	May
Wheat	59	67	85	84	85	84
Barley	98	91	98	96	96	105
Oats	81	97	85	84	85	82
Fat cattle	95	89	96	93	92	94
„ sheep	150	140	119	115	128	130
Bacon pigs	117	104	111	112	111	113
Pork „	120	106	114	117	112	108
Eggs	89	99	118	109	107	109
Poultry	129	125	122	120	115	121
Milk	162	162	171	171	215	162
Butter	85	87	93	95	96	96
Cheese	123	94	95	97	100	103
Potatoes	90	113	200	193	164	174
Hay	83	100	83	81	79	82
Wool	89	83	96	96	97	96
Dairy cows	100	98	103	102	100	101
Store cattle	88	90	92	92	94	96
„ sheep	103	105	104	102	109	107
„ pigs	134	115	129	123	122	118

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	120*	109*	125	125	122	117
Fat Cattle	—	102	110	107	106	107
General Index	116*	117	123	122	129	120

* Superseding figures previously published.

Foot-and-Mouth Disease.—No outbreak of Foot-and-Mouth Disease has been confirmed since January 26. At the time this issue of the *Journal* went to press, no part of Great Britain was subject to any restriction in connexion with Foot-and-Mouth Disease.

MISCELLANEOUS NOTES

Export of Breeding Stock

NUMBER and declared value of animals, living, for breeding, exported from the United Kingdom during 1935, with comparative figures for 1934. (From returns supplied by H.M. Customs and Excise.)

	1934		1935	
	Number	Declared Value	Number	Declared Value
CATTLE		£		£
Australia	92	15,696	52	10,365
Canada	32	2,441	29	3,722
Irish Free State	163	4,607	216	5,683
Kenya	14	640	24	1,117
New Zealand	2	355	5	1,033
Palestine	14	470	4	249
Union of South Africa	54	3,838	70	5,409
Southern Rhodesia	5	665	4	327
Other British Countries	7	280	16	986
Argentina	145	26,272	199	38,140
Brazil	5	671	47	2,225
Chile	—	—	8	524
Egypt	1	42	7	310
United States of America	3	262	32	2,935
Uruguay	13	1,615	11	1,788
Other Foreign Countries	39	2,285	7	275
TOTAL	589	60,139	731	75,088
SHEEP AND LAMBS				
Australia	52	2,560	53	2,332
Canada	18	76	74	1,822
Falkland Islands	21	500	—	—
Irish Free State	155	1,367	129	859
Jamaica	—	—	12	82
Kenya	13	161	6	109
Newfoundland and Labrador Coast	31	103	—	—
Union of South Africa	89	998	148	2,171
Other British Countries	10	117	2	120
Argentina	185	3,125	393	13,815
Brazil	17	583	63	801
Chile	30	340	31	958
Spain	26	265	—	—
United States of America	40	947	—	—
Uruguay	81	1,461	97	3,470
Other Foreign Countries	83	1,320	60	744
TOTAL	851	13,923	1,068	27,283

MISCELLANEOUS NOTES

	1934		1935	
	Number	Declared Value	Number	Declared Value
SWINE				
Australia	4	£ 111	13	£ 449
Canada	75	580	1	20
Channel Islands	2	30	56	108
Irish Free State	70	603	17	336
Malta and Gozo	10	175	32	686
Newfoundland and Labrador Coast	—	—	13	55
Union of South Africa	6	125	14	415
Other British Countries	7	184	11	175
Brazil	4	170	54	920
France	31	387	9	87
Germany	3	60	11	308
Hungary	—	—	39	834
Spain	12	147	1	25
Other Foreign Countries	40	1,016	34	1,018
TOTAL	264	3,588	305	5,436

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Building, Smith Square, London, S.W.1, on Tuesday, June 23, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders :—

Hertfordshire.—An Order fixing special overtime rates of wages for employment during the Corn Harvest of 1936. The overtime rate for male workers of 21 years of age and over is 11d. per hour, and for female workers of 19 years of age and over 8½d. per hour, with provision for the payment of overriding minima.

Suffolk.—An Order fixing special minimum rates of wages for male workers for employment during the Corn Harvest of 1936. The rate for male workers of 21 years of age and over employed on harvest work throughout the harvest period on farms of at least 60 acres of corn is not less than the ordinary minimum rate otherwise applicable, with in addition a bonus of £5 payable on completion of the harvest period ; the hours of work in respect of which this rate is payable are 11½ on any week-day whilst the harvest is in progress. For workers of 21 years of age and over who do not work on harvest work throughout the harvest period, or who are employed on farms of less than 60 acres of corn, the rate is 10d. per hour for all employment on harvest work.

Warwickshire.—An Order varying the existing minimum and overtime rates of wages, the rates as varied to come into operation on June 28, 1936. The minimum rates for male workers of 21 years of age and over are 31s. (instead of 30s. as at present) per week of 50 hours in any week in summer, except in the week in which Good Friday falls when the hours are 41, and 48 hours in winter, except in the week in which

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Christmas Day falls when the hours are $39\frac{1}{2}$ (instead of 48 hours in winter and 50 hours in summer as at present) with overtime unchanged at $8\frac{1}{2}d.$ per hour. Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Easter Monday and Boxing Day fall to meet cases where holidays are given in those weeks instead of in the weeks in which Good Friday and Christmas Day fall. For female workers of 18 years of age and over the minimum rate remains unchanged at $5d.$ per hour with overtime at $6d.$ per hour on weekdays and $7\frac{1}{2}d.$ per hour on Sundays, Good Friday and Christmas Day.

Enforcement of Minimum Rates of Wages.—During the month ending June 13, 1936, legal proceedings were taken against five employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Lancs ..	Lancaster	£ s. d. 3 0 0	£ s. d. 0 7 6	£ s. d. 7 9 6	1
Lincs (Kest-even and Lindsey) ..	Bourne ..	3 0 0	0 2 0	24 0 0	1
Middlesex ..	Barnet ..	5 0 0	0 5 0	23 0 0	1
Suffolk ..	Halesworth	6 0 0	1 1 0	48 10 0	3
Carmarthen	St. Clears	1 0 0	2 7 0	4 2 8	1
		18 0 0	4 2 6	107 2 2	7

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The Weekly Weather Report (March 4, 1934—March 2, 1935). Vol. LI, pp. 72. (London: His Majesty's Stationery Office. Price 7s. 6d., post free 7s. 8d.)

This publication, issued by the Meteorological Office, contains data relating to temperature, rainfall and sunshine for each week in the twelve months from the beginning of spring, 1934, to the end of the following winter period. The tables are arranged so that the whole sequence of data (with deviations from the average) for a single station occupies one page. The principal tables give data in this form for 57 selected stations well distributed over the British Isles. Other tables give the normal values for the twelve climatological districts of the British Isles and the deviation from the normal in each week, in each of the four seasons and in the seasonal year. The district tables show that during the period under review there was a slight excess of rainfall on the whole, the only districts recording a deficiency being South-West England, Eastern England, and the Midlands, with 97, 96 and 90 per cent. of the average respectively. Sunshine totals for the year differed little from the average; the summer was fortunate in having a substantial excess in all districts, although the winter was markedly dull. Mean temperature was decidedly above the average in all districts, the winter being particularly noteworthy in this respect owing to the phenomenally mild December, while spring was the only season which was, in most instances, slightly colder than usual.

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L'Agriculture à travers les âges : Histoire des faits, des institutions, de la pensée et des doctrines économiques et sociales. Tome II. (*Agriculture through the Ages. Vol. II. From Hammourabi to the fall of the Roman Empire*). By Émile Savoy. Pp. XVI + 478. 1935. (Paris VI^e: E. de Boccard, 1, rue de Medicis. Price of Vol. II to subscribers for the complete work—about 7 vols.—60 fr. For Vol. II separately, 75 fr.).

The first volume of this work was noticed in the issue of this *Journal* for August, 1935. Unfortunately, since that date the author has passed on. The second volume, the subject of this review, was practically completed when he died, and it has been edited by Professor Bondallaz of Fribourg. The author's death does not mean that the enterprise will be abandoned, because a plan has been devised whereby a co-operative effort will be made by a body of eminent historians to complete the work envisaged by Monsieur Savoy.

The volume under notice deals with the period from Hammourabi to the end of the Roman Empire. After a preliminary discussion of agriculture during the prehistoric period Monsieur Savoy proceeds to discuss the whole agricultural economy of the known world during some thousands of years. He had a complete knowledge of the very extensive literature of the various branches of the subject and his synthesis is well worth consideration.

Many historians have attempted to examine the evidence of history in order to explain the evolution of economic organization, but few would have had the courage even to lay down the lines along which a scheme of the magnitude of that attempted by this individual should be carried out. The first part of the book deals with the ethnological, geological, climatic and economic conditions of the countries concerned. It deals with all the essential factors—housing, clothing, tools, manners, exchange and means of communication—and in the final chapter discusses farming as practised under the economic conditions obtaining in antiquity. Book II is devoted to the consideration of agricultural production, its organization and the institutions by means of which it was conducted socially. Book III entitled "Capital," discusses the accumulation of capital in the ancient world, and Monsieur Savoy draws the conclusion that although the capital of antiquity was to a large extent the capital of human slaves, this system of exploiting the wealth of nature was one that could not be expected to be permanent.

Marketing Agreements under the A.A.A. By Edwin G. Nourse. Pp. xii + 450. (Washington: The Brookings Institution, 1935. Price 11s. 6d.)

During the comparatively brief but eventful life of the United States Agricultural Adjustment Administration, so much has been heard of production control and compensatory payments that it is seldom realized that the Act which created it gave powers to control and organize marketing through marketing agreements between producers and processors, or under licence from the Secretary of Agriculture. During the past three years experiments have been made with many different types of agreements, varying widely in purpose and covering commodities as divergent as milk, vegetables, rice, tobacco and queen bees. In the volume under review the Brookings Institution, which has already dealt at length in separate studies with such major commodities as wheat, meat and milk, surveys and analyses what has been done in more general terms.

The author traces the historical development of marketing legislation in the post-war period, which culminated in the Agricultural Adjustment Act of 1933, and after discussing the procedure adopted in bringing marketing agreements into being, briefly describes their character and some types

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of problem that it was attempted to cover. Subsequently, a number of agreements are examined in greater detail and methods of administration and enforcement are described. Finally, the regulatory, marketing and price control provisions are analysed, and an attempt is made to assess gains and losses to producers and to the community.

It is difficult to judge precisely what success was achieved. It is apparent that much useful work was done to improve standardization of produce, particularly of perishables, such as vegetables; to control marketing processes, to regulate shipments and to regularize trade practices. On the other hand, a high proportion of the agreements appear to have lapsed or to have been superseded.

In attempting comparison with this country, the first thing that strikes the reader is that almost all the marketing agreements appear to have been local in scope and limited in objective. There has been no attempt, for example, as under the British Pigs and Bacon Schemes, to organize marketing on a national basis. No doubt the fact that the United States is so large a unit, coupled with the limitations imposed by the federal constitution, has been largely responsible for this difference. Again, no provision appears to have been made for any independent *ad hoc* investigation of the problems confronting producers, such as has been carried out by Reorganization Commissions in Great Britain. The legislation under which agreements have been drawn up is far less definite, and seems to provide little in the way of safeguards to the interests affected. Indeed, it appears to be comprised in a few subsections of the Act which give powers to the Secretary of Agriculture to enter into marketing agreements with processors and producers and to issue licences.

The author, while critical of many features of the agreements, reaches the tentative conclusion that further experiment is desirable. Despite the decision of the Supreme Court, it still appears possible to proceed under existing legislation in so far as Marketing Agreements are concerned, and it is much to be hoped that such experiment will be encouraged.

Agricultural Progress on the Prairie Frontier. By R. W. Murchie, assisted by W. Allen, J. F. Booth, and others. Canadian Frontiers of Settlement, Vol. V. Pp. xii + 344; 96 Figs. and 16 Tables. (Toronto: The Macmillan Co. of Canada, Ltd.; London: Macmillan & Co., Ltd. 1936. Price 17s.)

During the past decade Dr. Murchie and his collaborators have been engaged in carefully-planned research for the purpose of ascertaining the extent to which the agricultural pioneers of the Canadian prairies have achieved success. Great care has been taken to select representative areas and adequate samples of farms, and the more important results of the investigations are now reported in this volume.

Agricultural development in the Canadian prairies may be said to date from 1812, when the first colony was planted by Lord Selkirk in the Red River Valley, a few miles north of the present city of Winnipeg. The completion of the Canadian Pacific Railway in 1885 marks a new era in the development of the area, and from that time there has been a rapid and continuous increase in population and agricultural production. The opening decade of the twentieth century was the peak period of immigration, to be followed by a decade of consolidation and organization. The quinquennium, 1921-25, was characterized by post-war recession, decline in the number of settlers and abandonment of farms. The next quinquennium showed considerable improvement, and it may be expected that the census of this year will record a net increase in the total amount of land devoted to field crops.

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Dr. Murchie's report analyses the present situation in detail, discussing such points as trends in agricultural production, utilization of lands, ranching, investments and land tenure, concluding with a particular survey of the various districts included in the investigations. Throughout the work one important fact has been kept to the fore, that successful settlement can only be achieved if an adequate income is possible—adequate in providing a reasonable standard of living, and adequate too in comparison with alternative means of livelihood. Such an income is evidently possible on the prairie frontiers of Canada.

Bee Farming in Britain. By Herbert Mace. Pp. 110 and 10 Figs. (Harlow, Essex: "The Beekeeping Annual" Office. 1936. Price 2s. 6d.)

"Bee farming," we understand, bears the same relation to beekeeping as market-gardening does to domestic horticulture, a pursuit which, like small-scale apiculture, is largely in the hands of amateurs. In this brochure the author, who is both a bee farmer of experience and the writer of some half a dozen books on bees, aims at showing how each operation in bee farming can be conducted on the most economical lines, and at the same time suggesting modifications of amateur practice calculated to make it a sound and reasonably sure method of gaining a livelihood. The book is illustrated with plates, maps and diagrams, and concludes with a chronological bibliography of the principal works on apiculture and tables of useful information.

The Home Market: A Handbook of Statistics. By Major G. Harrison, F. C. Mitchell and others. Foreword by F. Pick. Pp. xv + 149. Illus. (London: George Allen and Unwin, Ltd. 1936. Price 10s. 6d.)

Those who have previously regarded statistics as dull and uninteresting will be inclined to revise their opinion after perusal of this attractive volume. As Mr. Frank Pick says in his foreword, the book "takes the home market to pieces and sorts the bits first into one category and then into another." The question, "what can be done with the bits?" is then considered. Each of the twenty-one sections groups around a statistical table, facts and figures being set out in a form that will facilitate reference and convey information at a glance. The tables are frequently illustrated by pictorial diagrams based on the famous Neurath method. The subjects covered are various and of vital importance to the business man as well as to the ordinary intelligent citizen who desires a comprehensive view of present-day requirements and developments. There are sections dealing with Great Britain's population, its density, age and sex composition, regional distribution and urban concentration, data concerning population movements since the European war and probable changes during the next decade. Other sections show the number and size of families, estimates of future family statistics, estimated distribution of families according to social grade in each region and county, and in the principal urban centres of Great Britain. Other matters discussed include the activities of the population, industries in which it is employed, incidence and different degrees of poverty; the national income, its distribution and the distribution of wealth; earnings in the principal industries, with sample budgets of families with varying incomes. The value of this well-produced manual of statistics is enhanced by a bibliography of relevant publications, with examples of their practical utility.

Mechanised Farming. Vol. I., No. 1. Pp. 40. (London: Lombard Publications, Ltd. 1936. Price 1s.)

This publication, of which the first issue has been received, is described as "a quarterly journal presenting news, views, articles, photographs and

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information relating to successful farming with the aid of mechanical equipment and modern processes." This first number contains articles on "Agricultural Credit Service," by J. G. Jarvie ; " Rotary Cultivation," by G. B. Hony ; " My System of Farming," by A. J. Hosier ; the artificial drying of grass, the soya bean, the mechanics of manuring, and an account, by C. H. Schwind, of " How I started a Mechanised Cereal Farm," with other matter of interest to agriculturists. The new periodical includes a large number of illustrations.

Labour in Agriculture : An International Survey. By Louise E. Howard. Pp. xiv + 339. Issued under the auspices of the Royal Institute of International Affairs. (Oxford University Press. 1935. Price 18s.)

Agriculture is by far the largest industry in the world. The number of those directly dependent on it is probably nearly two-thirds of the world's population. In spite of this, Lady Howard's book is the first attempt at a general treatise on the problems of agricultural labour. The development of legislation for the protection of the agricultural worker has been hindered both by administrative difficulties and by its relative unimportance as a political issue, owing to the frequent absence of the sharp economic differentiation between employer and worker which exists in every factory industry. Legislators have tended to neglect the problem, and their example has been followed by students of industrial relations. But in 1922 the Permanent Court of International Justice gave an advisory opinion declaring agricultural labour conditions to be within the competence of the International Labour Office, and it is on work done at this Office by the author herself and other members of the staff that the present book is in part based.

The body of the book consists of a survey of the " conditions of work and living " in agriculture, under which head are analysed the general form of the labour contract in different countries, the agricultural labour codes, hours of work, housing, education and the right of association and combination ; followed by three chapters on " economic conditions "—discussing wages, labour efficiency, and problems of the agricultural labour market. There is a final chapter of conclusions, and seven appendices on special subjects.

Lady Howard's conclusion that " the situation of the employed agricultural worker is not a good one " is not likely to cause surprise—a similar statement has been made many times. The reforms that she considers necessary for its improvement include the shortening of hours, protection against industrial risks, higher wages, collective bargaining, elimination of fatigue and abolition of indebtedness. Schemes of land settlement in the interest of the urban unemployed ought to be carefully scrutinized lest the competition of new rural workers should undermine the position of the old.

The crucial difficulty is the problem of international competition. The competitive power of the exporting countries of the new world, however, is not based on the degradation of labour, but on an advanced technique, the imitation of which in importing countries would tend to abolish the methods " which make agriculture so incredibly laborious to thousands of human beings," and at the same time to lessen the force of the competition facing them. We should be courageous enough to recognize that " to carry on the biggest industry in the world with an application of human effort of which a colossal proportion is not required is an obstruction to human progress." Mere preservation of a peasant system, without radical modification, is not a sufficient aim to justify defence at all costs. Tariff policy should have the definite object of raising standards of efficiency and improving the conditions of labour : and the improvement thus achieved should be safeguarded by

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international conventions establishing common standards of treatment for labour in different countries.

Perhaps the foregoing summary will make clear both the magnitude of the subject and the thoroughness with which the author has treated it. That there should be certain restrictions on the scope of her survey is hardly a matter for complaint in view of the frequent absence of printed information regarding a form of labour which, as she observes, is often taken for granted without analysis simply because it is the oldest form of labour. For this reason the main emphasis of the survey is on European countries, the United States and the British Dominions; one of the appendices, however, contains a note on the labour contract in tropical and sub-tropical agriculture by Mr. C. W. H. Weaver. The most serious omissions relate to Soviet Russia and recent (*i.e.*, post-1933) legislation in Germany and Austria. For these the author excuses herself on the ground that Soviet agriculture is already well documented and that as regards the other two countries it is too soon to say how complete a breach with the past will be involved by recent (and future) developments. These omissions do not alter the fact that Lady Howard has successfully undertaken a very formidable task. She is to be congratulated upon a contribution to the literature of agricultural economics which is likely to be of permanent value.

Some Chemical Methods of Weed Destruction. By H. C. Long, B.Sc., and R. K. MacDowall, Dip. R.T.C., A.M.I.Chem.E. Pp. 24 and 10 Figs. (Obtainable from H. C. Long, "The Birkins," Orchard Road, Hook, Surbiton, 1936. Price 6d., post free.)

This pamphlet, a reprint from *The Journal of the Royal Agricultural Society of England*, is intended to supplement the information contained in a brochure entitled *Suppression of Weeds by Fertilizers and Chemicals*, published by the first-named author in 1934. It reviews and summarizes the most recent research on the subject, and includes an account of modern machinery designed for weed destruction. Those who desire to adopt up-to-date chemical and mechanical methods of dealing with weeds will find this pamphlet very useful, while the bibliography provided will furnish a convenient guide to further study.

The Rural Exodus in Czechoslovakia. Studies and Reports of the International Labour Office. Series K. (Agricultural) No. 13. 1936. (London: Published for the I.L.O. (League of Nations) by P. S. King and Son, Ltd. Price 5s.).

This is the second of a series of studies of movements of agricultural population undertaken jointly by the International Labour Office and the International Institute of Agriculture. It is premised that the natural surplus of births over deaths in rural areas cannot, under modern conditions, be absorbed by increased requirements for labour in agricultural production, as any increased demand for food supplies arising from the increase in the population as a whole is more than counterbalanced by the improving technique of agriculture. In pre-war days the natural increase of the rural population in the territory which now forms Czechoslovakia found an outlet in three ways: (1) internal migration to industrial areas, (2) seasonal migration internally and to adjoining countries, and (3) permanent emigration. Under post-war conditions the last two avenues have been very much restricted, but the first somewhat improved after the war, owing to increased industrial activities, although some restriction in this connection has been evident since the onset of the world depression.

In Czechoslovakia the rural economy has been materially affected by the extensive breaking up of large estates into small-holdings, but this movement has by no means replaced the former avenues for the natural increase in the rural population. The authors of the review have come to the

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conclusion that whereas the endeavours to develop industrial enterprises in the Republic are seriously handicapped by the difficulty of finding foreign markets, there are possibilities of securing a better equilibrium internally between industry and agriculture. It is suggested, for example, that where land has been split up into uneconomic units, some consolidation of holdings may be advantageous. In the eastern provinces extensive forests provide opportunities for conversion of large areas for agricultural purposes. An interesting side issue to which attention is called is that the vast improvement in local transport services in recent years has meant that workers who transfer from agriculture to other occupations do not necessarily have to leave their village homestead, as they often find industrial employment in factories that have been established in the neighbourhood of rural areas. The "exodus" may thus nowadays not be rural but simply agricultural.

The British Goat Society's Yearbook for 1936. Pp. 179 and 65 figs. (Compiled and issued by the Secretary, H. E. Jeffery, Roydon Road, Diss, Norfolk. Price 1s. 6d.)

This annual publication possesses more permanent interest than is usually suggested by the term "Yearbook." Medical men express favourable opinions concerning goats and their milk; Dr. W. E. F. Tinley writing on "The Poor Man's Cow," Dr. S. J. Watson on "The Vitamin 'A' Content of Goat's Milk," and Dr. H. Carpenter on "The Value of Goat's Milk in the Prevention and Treatment of Disease." There are articles on goatkeeping in France and Ontario; while Mr. J. A. Caseby, the honorary secretary of the Welsh Goat Breeders' Association, writes informatively on "The Welsh Goat." Of practical value are the contributions by Captain A. A. Plumptre on "Exhibiting" (which he sharply distinguishes from mere "showing"), and by Mrs. Arthur Abbey "About Judging," besides a number of helpful papers by veterinarians. The Annual Summary of Milk Yields shows that new records have been established for the British and British Saanen breeds, while the maximum yield of goats recorded during the year 1934-35 has increased from 4,698 lb. 6 oz. to 5,321 lb. 9 oz. Excellent illustrations, statistical tables and other useful data combine to make this an indispensable manual of reference for the goatkeeper.

Raspberries and Kindred Fruits. By E. Markham, A.H.R.H.S. Pp. vii + 68, and 10 Plates. 1936. (London: Macmillan & Co., Ltd. Price 6s.)

This brochure traces the history of the raspberry from the earliest times to the present day, and names a number of modern varieties suitable for summer and autumn fruiting. Garden methods of culture, and an interesting method of forcing canes in pots, are described. There are chapters on insect pests, the loganberry, hybrid berries and the cultivated blackberry. The subject is well presented and illustrated by excellent plates showing fruiting branches.

Early Vegetables Under Glass. By J. S. Dakers. Pp. viii + 171, and 42 Figs. 1936. (London: Cassell & Co., Ltd. Price 2s. 6d.)

Growers for the market have long used frames, cloches and other devices with glass, to provide salads and vegetables in advance of their normal season, and the author sees no reason why such apparatus should not be adopted by amateur gardeners. Methods of making hot beds with manure, composting suitable soil, and the management of frames are described in detail, complicated points being illustrated with simple drawings. The author also names varieties of lettuce, carrots, radish, turnip, etc., suitable for growing in frames. It is claimed that by using the methods described the British gardener will achieve the same success as the horticulturists

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of Holland and France. The text is assisted by 8 half-tone plates and numerous useful diagrams.

Le Fermier Constructeur : Art de Bâtir à la Campagne (*The Farmer Constructor : the Art of Building in the Country*). By R. Champly. 2nd edition. Pp. 224 and 230 Figs. (Paris, Vle. : Librairie Agricole et Horticole de la Maison Rustique, 26 rue Jacob. 1936. Price 11 frs.)

This is a revised edition of a useful little manual that has been well received in the country of its origin. The author is a specialist in practical problems that present themselves to the attention of farmers, small-holders and other rural dwellers, who are frequently faced with the need for urgent repairs, or with the desirability of a certain improvement, which must be effected without invoking the services of an outside tradesman. The subjects discussed include water supply, simple planning, tools of various sorts and how to use them, carpentry, masonry, brick-laying, wall-papering, fencing and road-making. A chapter of considerable interest is that which deals with construction in *pisé de terre*. Agriculturists and others who can follow M. Champly's easy French will find in this handy volume valuable hints for the maintenance and repair of their buildings and equipment.

The Book of the Mushroom. By A. Defries. Preface by J. Ramsbottom, O.B.E., M.A. Pp. xiv + 130, and 24 Figs. (London : Methuen and Co., Ltd. 1936. Price 5s.)

Few crops have been the subject of so much popular interest or irresponsible propaganda as mushrooms, and this book, written by an experienced grower, from an unbiased angle, is an extremely useful addition to the literature suitable for the study of intending growers of mushrooms. The great value of the book lies in the details given, which, though apparently insignificant, may make a big contribution towards success or failure. For example, important differences between closely similar types of horse-manure, the quantity of fresh manure required and its loss in weight during turning, problems connected with fetching manure from stables, the employment of skilled or less skilled labour on the various operations—are examples of the type of information given, which, it is truthfully asserted, has not been published elsewhere. The whole procedure of raising mushrooms is described in detail and a chapter on pests and diseases is included, although the maintenance of healthy conditions by preventive measures is wisely advocated as preferable to attempts at curative treatment. The practical grower is rarely endowed with the gift of recording the results of his experience so that others may learn in less bitter a school, and the exception here under review deserves commendation.

Journal of the Yorkshire Agricultural Society, 1935. Pp. 194. (York : A. S. Cavers, St. Leonards. Price 5s.)

This annual publication chronicles the activities of the Society during the past twelve months, and contains in addition a number of articles of practical value to agriculturists whether Yorkshiremen or not. In this interesting issue, Mr. H. V. Garner writes on "Recent Experiments on Grass Land with Basic Slags and Rock Phosphates," Mr. C. H. Blagburn on "Recent Developments in the Pig Industry" and Professor J. A. Hanley on "The Better Utilization of Our Grass Land." "Some Aspects of Animal Husbandry" are discussed by Professor W. C. Miller, and Mr. J. W. Robertson Scott contributes an account of "A New Kind of Rural Industry," viz., the production of our contemporary, *The Countryman*, of which he is editor. Readers with a flair for agricultural history will be interested in Mr. G. D. Amery's notes on "Early English Agricultural Writers."

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATIONAL STAFFS: WALES

Caernarvonshire : Mr. Gwilym Roberts, N.D.P., has been appointed County Poultry Instructor, *vice* Mr. H. R. Jenkins, N.D.P.

WIRELESS TALKS TO FARMERS, JULY, 1936

<i>Station</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National :			
	7.5	Suspended for the Summer	
July 5	2.0	Mr. R. Gamble, Secretary of King's Lynn and District Beekeeping Association	A general survey of Beekeeping.
July 12	2.0	Not yet fixed	Hive, Bees, and Honey.
July 19	2.0	Not yet fixed	The Craft of Bee-keeping.
Western :			
End of Month	Not fixed	—	Down on the Farm : A broadcast from a West Country farm.
Welsh :			
July 6	9.50	Colonel H. C. L. Howard	Preparations for the Royal Welsh Show, Abergele.
July 22	9.50	Dr. R. Alun Roberts	Eye-witness account of the first day's events at Abergele.
Scottish :			
July 9	8.0	Mr. W. G. R. Pater-son	For Scottish Farmers.
July 16	6.55	Mr. Joseph F. Dun-can	The Farm Popula-tion in Scotland.

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

- Changes in English Agriculture. *J. W. Best.* (Jour. Bath W.S. Co. Ass. 6th Series, 10 (1935-1936), pp. 96-101.)
- Studies in Bibliography—V. English Agriculture: From Arthur Young to William Cobbett. *G. E. Fussell.* (Econ. Hist. Rev., 6, 2 (April, 1936), pp. 214-222.)
- The Technique of Early Field Experiments. *G. E. Fussell.* (Jour. Roy. Agric. Soc. Eng., 96 (1935), pp. 79-88.)
- In Defence of Mixed Husbandry. *R. McG. Carslaw.* (Jour. Roy. Agric. Soc. Eng., 96 (1935), pp. 5-22.)
- Half a Century of Changes in an East Anglian Farm. *S. H. Carson.* (Jour. Roy. Agric. Soc. Eng., 96 (1935), pp. 45-78.)

SELECTED CONTENTS OF PERIODICALS

- Farm Cost-Accounting. *J. Wyllie*. (Jour. Fmrs.' Cl., Lond., 4 (May, 1936), pp. 55-75.)
- Land Settlement and Unemployment. *A. W. Menzies-Kitchin*. (Jour. Proc. Agric. Econ. Soc., 4, 2 (April, 1936), pp. 135-149.)
- Beekeeping. *J. Cunningham*. (Trans. Highl. Agric. Soc., Scot. (5th Series), 48 (1936), pp. 12-36.)
- The Agriculture of Somerset. *W. D. Hay*. (Agric. Progr., 13 (1936), pp. 36-41.)
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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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Extension Lectures on Agricultural Subjects

THE programme of lecturers and the subjects they are prepared to speak about under the Ministry's Extension Lecture Scheme in the forthcoming winter session, has now been issued. The scheme was inaugurated in 1923 and since then the number of lectures delivered has steadily increased year by year until last year nearly 250 lectures were delivered. This large number alone shows that the advantages of the scheme have been widely appreciated. There is, however, scope for a further considerable increase in the number of lectures given, since the lectures offered in the programme exceed three times that number.

The objects of the scheme are to make available to the practical farmer and horticulturist, expert advice and information on a wide range of subjects, during the long winter evenings when the farmer has perhaps more leisure and the inclination to listen to the experts and specialists who may deal with his everyday problems.

In a brief note it is hardly possible to give any concrete idea of the variety of subjects or the names of the lecturers available under the scheme, but it may perhaps be said that the most familiar and famous names in all branches of agricultural science are included in the programme. In a number of instances it is possible to illustrate the lectures by lantern slides or films, where electric current is available.

In the past, lectures have been delivered to local agricultural societies and clubs all over the country, in addition to many branches of the National Farmers' Union.

In order to obtain the services of lecturers for groups of farmers, agricultural societies or clubs, application should be made to the Agricultural Organizer for the county concerned

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for information whether a lecturer on the particular subject desired is available, and the Organizer will endeavour to make arrangements for the lecture to be given.

Information on Weed Destruction

SINCE the first year of the present century, the Ministry has repeatedly directed attention to the part played by weeds in farm economy, and during the period has dealt with the destruction of weeds in a number of leaflets that have had a very large distribution. Realizing that there is a considerable demand for information on this very troublesome subject, the Ministry in 1927 issued a bulletin entitled *Poisonous Plants on the Farm*, in 1929 a second entitled *Weeds of Arable Land*, and in 1932 a third on *Weeds of Grass Land*,* all three prepared by Mr. H. C. Long. The demand for these volumes has been excellent, the sales of each averaging some 300 to 400 copies a year. Each book is well illustrated with photographs and line drawings, while that on *Weeds of Grass Land* contains also a dozen coloured plates.

Closely connected with the question of losses of livestock on the farm is the extent to which plants of a poisonous character are present. Though the wild plants that are seriously poisonous are perhaps few in number compared with the total species included in the British flora, yet there are many that occur quite commonly, and may occasionally cause serious losses of farm stock, while they may also result in illness and death to human beings, particularly children. Many wild plants also cause taint in milk when they are eaten by dairy cows, or of the flesh of cattle or sheep that are about to go to the butcher.

Apart from poisonous plants, the reduction of weeds is intimately associated with grass land improvement and the raising of arable crops, and any means that will enable the farmer to reduce weeds, within reasonable limits as to cost, will tend to increase his useful crop.

It cannot but be of great value to farmers and gardeners to be in a position to recognize poisonous plants and weeds

* Bul. No. 75 (*Poisonous Plants on the Farm*), paper cover, 2s. (2s. 3d. post free); cloth boards, 3s. (3s. 4d. post free).

Misc. Pub. No. 61 (*Weeds of Arable Land*), quarter bound, 3s. (3s. 5d. post free); cloth boards, 3s. 6d. (3s. 11d. post free).

Bul. No. 41 (*Weeds of Grass Land*), paper cover, 5s. (5s. 5d. post free); cloth boards, 6s. (6s. 6d. post free).

(All from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.)

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generally and to have a knowledge of their life history and habits. Such a knowledge of a given species will at the outset often enable one to judge whether it is likely to cause serious trouble, and will largely indicate what type of protective and remedial measures may most successfully be adopted.

Fruit Supplies in 1935*

A SATISFACTORY feature of the trade returns for last year is that relating to fruit supplies, and the Imperial Economic Committee has just issued, under the above title, its annual review of production and distribution of fruit throughout the world. The volume, which is the sixth of its series, contains an analysis of the imports of fresh fruit, vegetables, flowers and bulbs into the United Kingdom, seasonal surveys of fruit shipments and statistics relating to the domestic production of fruit and to imports into foreign countries.

It is encouraging to note that of the total imports of raw fruit into the United Kingdom for 1935, which, at 1,480,000 tons, exceeded those of any previous year, over half (for the first time) came from Empire countries. The advance that has been made by these countries is strikingly illustrated by the fact that the fruit marketed by them in the United Kingdom during the year, considerably exceeded the total quantity imported from all other countries in any of the years immediately preceding the War of 1914-18.

Aggregate supplies from the Empire overseas totalled 777,000 tons, an increase of 156,000 tons as compared with 1934, accounting for practically 53 per cent. of the total imports, in comparison with the previous highest proportion of 46 per cent. in 1934 and an average of 20 per cent. in 1919-23 and 15 per cent. in 1909-13. Imports of fruit from foreign countries also expanded considerably for several years after the War, and in 1931 reached a total of 1,036,000 tons, since when there has been a marked decline, until in 1935 imports from foreign sources amounted to only 703,000 tons, the lowest figure recorded since 1921.

Consumption of fruit in the United Kingdom has steadily increased during recent years, and in 1934, when home production was exceptionally heavy, the total supplies available for consumption, at nearly 2,000,000 tons, were equivalent

* Published for the Imperial Economic Committee by His Majesty's Stationery Office. Price 2s. 6d. ; post free 2s. 9d.

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to 96 lb. per head of the population, or about 20 lb. more than in 1934. Although, owing to the poor crop in the United Kingdom last year, net supplies declined by over 300,000 tons, the apparent quantity available per head, at 79 lb., attained the level of 1931-32.

Imports of apples, pears, plums, bananas and grapefruit were all substantially heavier than in 1934, imports of bananas and grapefruit reaching new high levels, but owing to shortage of supplies in Spain and Italy there was a further decline in imports of oranges, lemons and grapes. Imports of bananas, grapefruit, lemons, pears, grapes, plums and apricots from Empire countries were in each instance greater than in any previous year; imports of Empire apples were heavier than in any year except 1933; while aggregate imports of fruit from South Africa, the British West Indies and Palestine, constituted new records.

This survey should prove useful to all who are interested in an Empire industry of increasing importance.

The Jones-Bateman Cup for Research in Fruit-growing

THE Royal Horticultural Society has intimated that the Jones-Bateman Cup is available for award this year. The Cup, a valuable silver-gilt replica of the Warwick Vase, was presented to the Society, in 1920, by Miss L. Jones-Bateman, of Cae Glas, Abergele, as a trophy to be used for the encouragement of fruit production. The Society accordingly decided to offer it triennially for researches in the growing of hardy fruits, figs, grapes and peaches in the open or under glass.

Candidates for the award must submit accounts of their work by October 31, 1936, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.1. Three assessors, two appointed by the Society and one by the National Farmers' Union, will report to the Council of the Society upon the originality and comparative potential value to the fruit-growing industry of the work of the respective candidates. The Council will award or withhold the Cup at its discretion.

A successful candidate will hold the Cup for three years, giving a bond for its safe return; and, on returning it to the Society, will receive a commemorative gold medal. Winners of the award are eligible to compete on the next or any subsequent occasion.

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Guide to Current Official Statistics

To-day, as never before, it is realized that before social phenomena can be understood they must be measured. The means of measurement are provided by the multitudinous statistics now available on all kinds of subjects; among these, a leading place is taken by the hundreds of volumes produced every year by the Stationery Office, the publishing house of the central Government.

It has long been recognized, both in official circles and by the private user of statistics, that this immense body of material cannot be utilized to the best advantage without the aid of an alphabetical index which arranges the statistics under subject headings, and indicates the time and place to which they relate and the degree of detail in which they are analyzed.

It is for this purpose that the *Guide to Current Official Statistics* is prepared every year under the auspices of a standing committee of Government statisticians. *Volume Fourteen* of this handbook, relating to the official statistics published in 1935, has just been published. It contains 365 pages, and is obtainable from the sale offices of H.M. Stationery Office, or through any bookseller, for 1s., by post 1s. 5d.

Advisory Leaflets

SINCE the date of the list published in the May, 1936, issue of this JOURNAL (p. 107), the undermentioned Advisory Leaflets have been issued by the Ministry:—

- No. 98. Peppermint: Its Cultivation and Distillation (Revised).
- No. 146. The Valuation of Artificial Manures (Re-written).
- No. 180. The Cultivation of Raspberries (Revised).
- No. 182. Spurrey (Revised).
- No. 262. Kales.
- No. 268. Plums and Damsons.
- No. 270. Soil Analysis.
- No. 271. Potato Blight.

Copies of any of the above-mentioned leaflets may be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1d. each net (1½d. post free), or 9d. net per doz. (10d. post free).

Single copies of not more than 20 leaflets may, however, be obtained, free of charge, on application to the Ministry.

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Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A list of the Ministry's publications, including leaflets, on agriculture and horticulture may be obtained free and post free on application to the Ministry.

A Grass Driers' Association

A GRASS DRIERS' ASSOCIATION has been formed by twenty of the leading producers of dried grass in England, Scotland and Wales. The object of the Association is to arrange the marketing of the product, and one of its main aims, therefore, is to see that purchasers obtain the particular quality of grass they require. For example, dairy farmers and stock-breeders need grass of the highest quality and richest in colouring matter and vitamins, which are necessary for producing "summer" quality milk in winter, and for keeping breeding stock and young animals in healthy condition. Other and lower grades of dried grass are suitable for horses, fattening cattle, sheep, etc. The Association has already met and agreed upon a grading schedule for dried grass, so that it is in a position to supply grass of any standard which may be demanded.

A large number of applications for membership of the Association have been received from individuals and firms connected with agricultural work, and it seems likely that, founded as it is on a voluntary basis by farmers who are producing mechanically-dried grass, it will develop into a useful marketing organization.

The present address of the Association is Grass Driers' Association, Billingham, County Durham.

Lancashire County Farm, Hutton: Building Scheme

THE existing system of agricultural education in Lancashire is centred on an Agricultural School at the Harris Institute, Preston, with a Dairy School at Hutton, where there are also Poultry and Horticultural Stations. Courses extending over two winters are provided at the Harris Institute and prepare students for a Certificate in Agriculture, but no residential accommodation is available. At Hutton the instruction given leads to Junior and Senior Certificates in Dairying, the National Diploma in Poultry-husbandry and a Junior Certificate in Horticulture. There is a hostel for girls only at Hutton.

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A scheme to provide for the transfer to Hutton of all the instruction described above, and for the erection there of a men's hostel, has recently been sanctioned by the County Council and approved by the Ministry, and it is hoped to open on the new basis in the autumn of 1937. The opportunity is to be taken to centralize the county agricultural education service at Hutton, and administrative offices will therefore be erected. Additional lecture rooms and laboratories will replace those vacated in Preston, thus allowing a much closer association of science and practice than has been possible in the past. The total estimated cost of the scheme is approximately £30,000.

The Situation of the Wheat Crops at Mid-June, 1936

THE International Institute of Agriculture issues the following summary of the recent information received by it on the situation of the wheat crops in Europe and neighbouring countries in the middle of June.

The weather conditions experienced in May in Europe showed great variation from place to place. The month was rather dry in the north, but in Central Europe rainfall was rather heavy, while in the south it was excessive. Temperatures in most parts were below normal. More seasonable weather did not set in until the end of the month. Temperatures then rose, but they were still below normal throughout the first half of June. Violent showers were frequent, and, except in the north, where there were reports of drought, rainfall was above the average.*

These conditions were somewhat unfavourable for earing, flowering and growth in general in France, Spain and Portugal, Italy and Greece. The situation of the crops in this region did not deteriorate seriously from what it was at the beginning of May, but the outlook was appreciably less favourable than it was at the beginning of June of last year. In other areas, however, particularly in the Danube countries, the crops were in a better state than they were a year ago.

On the basis of the condition of the crops in the middle of June and the area cultivated, the International Institute of Agriculture considered that the prospects were very satisfactory in all the exporting countries, i.e., the four Danubian countries, Poland and Lithuania. In the other countries, forming the importing group, the outlook was not so promis-

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ing and the crops appeared to be below average. If weather conditions are normal up to the time of harvesting, the total European wheat crop should be within five or six million quintals of the comparatively plentiful harvests of the last two years and larger than all other post-war crops with the exception of that of 1933, which was a very high record.

Conditions in the U.S.S.R. were favourable during May and the first half of June, and it was found possible to make up for the leeway in the spring sowings. The condition of the crops in the middle of June was satisfactory, especially in the important wheat areas of the south. The spring wheat harvest, which represents two-thirds of the total wheat production of the U.S.S.R., depends on the rainfall between mid-June and mid-July, but on June 15 the outlook was good and promised a crop at least equal to the very large crop of last year.

Egypt is the only country in North Africa that expects a crop a little above the average and equal to that of last year. Algeria expects its out-turn to be nearly average, but Morocco, Tunisia and Libya report mediocre crops, and North African production, on the whole, will be reduced.

Agricultural Machinery Testing Committee

THE undermentioned Certificate and Report issued by the Ministry, have been published in pamphlet form:—

No. 63. The Fowler "Three-Thirty" Diesel Crawler Tractor.

The test was conducted at the Institute for Research in Agricultural Engineering, University of Oxford.

Copies of the pamphlet may be obtained price 2d., post free 2½d. each, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

The International Conference of Agricultural Economists

THE Fourth Meeting of the above Conference is to be held from August 30 to September 6 next, at St. Andrews, Scotland. Mr. L. K. Elmhirst, Dartington Hall, will preside, and the opening paper will be delivered by Professor W. R. Scott, President of the Royal Economics Society. Further inquiries should be addressed to Mr. J. R. Currie, Dartington Hall, Totnes, Devon, Secretary of the Conference.

LIVESTOCK POLICY

Statement made by the Rt. Hon. Walter Elliot, M.P., M.C., F.R.S., Minister of Agriculture and Fisheries, on Monday, July 6, 1936, in reply to a Question in the House of Commons by the Leader of the Opposition, Mr. C. R. Attlee, M.P.

1. I can now indicate in broad outline the Government's permanent proposals for safeguarding the livestock industry. I must apologize for the length of the statement, but it is of interest and importance not only to this House but to producers both at home and overseas.

2. The Government propose to proceed on the basis of a regulated market with the maximum supplies for the consumer consistent with a reasonable level of remuneration for the producer.

3. It is the Government's desire that, at the earliest possible date, the responsibility for securing stable market conditions should be assumed by producers in the various countries concerned and exercised in the light of joint discussion of the problems involved.

4. This discussion would be secured by the institution of an Empire Meat Council, representative of the United Kingdom and other Empire countries concerned, and an International Meat Conference, representative of the United Kingdom, other Empire countries and the foreign countries supplying substantial quantities of meat to this market.

5. It would be proposed that, unless agreed otherwise by the Conference, aggregate exports to this market of beef (frozen and chilled and the meat equivalent of fat cattle) during each of the next three years should not exceed recent levels.

6. Further proposals as to market regulation, which mainly affect the exporting countries, are under discussion with the Governments of the countries concerned. Full details will be given in due course.

7. The Government have given earnest consideration to the position of the United Kingdom cattle producer under these arrangements, and they propose to invite Parliament to make provision for a permanent scheme for the payment from the Exchequer of a subsidy to producers of fat cattle in the

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United Kingdom which, while not stimulating an artificial expansion of the home industry, will continue for so long as and to the extent that the situation may require.

8. As the House will be aware, my Rt. Hon. Friend the President of the Board of Trade is at present in negotiation with the Argentine Government on the terms of a Trade Agreement to take the place of that now in force. I cannot forecast the terms of any settlement that may be reached, but I am able to say that in any event Parliament will be invited, immediately after the summer recess, to pass legislation providing for the collection of Customs duties on imports of chilled, frozen and other descriptions of beef and veal from foreign countries. The revenue derived from these duties will accrue directly to the Exchequer. It is not proposed, as part of the arrangements in contemplation, that there should be duties on imports of beef from Empire countries or on imports of mutton and lamb from any country.

9. The Government are of opinion that if adequate provision is to be made in one form or another for the needs of the United Kingdom cattle industry, the aggregate financial assistance now given to it must be increased until such time as the conditions prevailing in the industry improve. They propose to seek the authority of Parliament to apply to the assistance of the industry such sums not exceeding £5 million per annum as may from time to time be needed. Parliament will be asked annually to make provision for a sum not exceeding this amount. As an offset to this liability, the Exchequer will benefit to the extent of the revenue from the import duties to which I have referred.

10. The Government are desirous of providing that the payments made to the home producer of fat cattle under the permanent scheme shall be so adjusted as to give further encouragement to quality production. No final decision has been reached as to the measures to be taken to this end, but the Cattle Committee, which administers the present temporary subsidy, have for some time had the practical aspects under consideration and will now consult with the various interests concerned.

11. As regards mutton and lamb, imports of which are at present regulated in the case of foreign imports under statute, and in the case of Dominion imports by voluntary arrangements, the Government propose to continue the present system for the year 1937. The question will fall for

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consideration in due course whether thereafter the International Meat Conference, in association with the Empire Meat Council, should operate in regard to exports of mutton and lamb to this market.

12. The Government hope that the arrangements they contemplate for the stabilization of the meat market will work to the satisfaction of all interests concerned, but as a precautionary measure they will ask Parliament to give them general powers to regulate imports of livestock and meat should the need arise.

13. The House will be invited to pass, before rising for the summer recess, a short interim measure extending, without modification, the existing cattle subsidy arrangements until, if necessary, July 31, 1937, and legislation to give effect to the permanent proposals, including measures for the encouragement and promotion of efficiency, will be placed before Parliament early next session.

CATTLE AND SHEEP FATTENING ON A LEICESTERSHIRE GRAZING FARM

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IN view of the present situation with regard to beef production, some facts relating to a Leicestershire grazing farm are not without interest.

The Farm. Situated on the Lower Lias some 14 miles west of Market Harborough, the farm extends to 257 acres, mostly very heavy land. Like the Harborough pastures the grass is considered to be capable of fattening big cattle without the aid of concentrates.

Unlike neighbouring farmers who practise dairying, the owners have preferred non-dairying pursuits, because of a personal disinclination for dairying and a desire to bring their farm, bought in poor condition in 1921, to a high pitch of fertility.

Early Policy. In the early years of the tenure the condition of the farm was gradually improved, and by 1928 the last of the 42 acres of arable land had been laid down to grass. Until the autumn of 1926 the system of farming was centred upon the rearing of store cattle and sheep and the maintenance of a flock of about 250 Rhode Island Red hens. Each year about 40 calves were bought in the local auction markets, for eventual sale to Norfolk feeders at from 2 to 2½ years old. Lambs bred from a flock of 80-150 Kent, Kerry Hill and Half-bred ewes were sold as stores in September. A herd of Gloucester Old Spot sows was also kept, the progeny being either sold as weaners or fattened in winter. Although the herd was yielding useful profits, it was decided to give up pig production in 1925.

Recent Policy. By 1926 it became clear that the cattle and sheep policies were not financially successful, and it was then decided to substitute a system of fattening for that of rearing. The change was accomplished in the autumn of 1926, and it is for that reason that this account is concerned with the results for the eight years commencing on March 25, 1927. During this period the activities of the farm have been those incidental to the sheep and the fattening steers and heifers, of which details follow, and to the increasing flock of poultry. Although the increase of the size of the laying flock from 300

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to 1,600 has certainly reduced the number of livestock that can be carried in winter, it has been associated with a greater capacity in summer. The necessary horses have been kept, a foal being bred in each of the years 1933 and 1934. Otherwise the only activities have been the disposal of a small herd of pedigree cattle early in 1928, the profitable fattening of some cows at grass in 1928, and the unprofitable experiment in 1932 of handling cows to sell as down-calvers.

The Cattle. During these eight years the usual practice has been to buy in 2-year-old steers for fattening off the grass as soon as possible.

In most years, Shorthorn types predominated, the proportions varying from 26 per cent. in 1934 to 88 per cent. in 1931. In 1927 and again in 1933 and 1934 about 40-50 per cent. were of Hereford type. Welsh Runts reached 28 per cent. in 1928 and 1933, and Aberdeen Angus and Galloway types were fed in fairly big numbers in 1929 and 1930. Some West Highland cattle were fed in 1929. The proportion of heifers has varied, but has never been high. Although they have normally yielded prices from 1s. to 5s. per cwt. higher than those obtained at the same time for steers, they are not favoured.

In the earlier years, approximately half the beasts were bought in the spring or summer of the year in which they were sold, the rest being bought in the spring or autumn of the previous year. The grazier normally winters some cattle in order to have a few beasts in forward condition in spring and easily prepared for sale in early summer, when prices are high. He also expects that any spring purchases will have to be made in a rising market. For the latter reason, wintering has been more profitable than spring purchase on this farm in three of the last five years. On the other hand, since the wintered cattle have increased little in weight despite an allowance of hay and about 3 lb. of cakes and meals, very few have been ready for really early sale. This fact, coupled with the desirability of preserving the good homeland from undue wear (from 40 to 60 head being agisted during the winters of 1928-29 to 1933-34, for this reason) has led to a decrease in the proportions wintered until, for the grazing season 1935, none were wintered. No summer grazing has been hired for cattle.

Although most of the cattle have been bought from dealers in the Rugby and Leicester markets, some, as in 1934, when

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over half the cattle came from Herefordshire and Radnorshire, have been purchased in the markets in the rearing areas.

During the summer and autumn, the cattle that are being fattened receive rations rising to about 2 lb. of maize meal, 1½ lb. of linseed cake flakes, and 1½ lb. of Egyptian cotton cakes. Any of the fat cattle that are still on hand in winter receive hay and approximately 14 lb. of cakes and meals. In the earlier years it was not possible to feed young beasts, because they scoured badly on the "strong" grass; but now, judicious hand-feeding enables such cattle to thrive well and to put on increases of well over 2 lb. per day. The increasing difficulty, experienced on this farm, of marketing the big cattle that can be fattened without cake, has led to the choice of younger stock for feeding, even stock that have not "moved a tooth" being handled.

In a valuable survey in 1928, Bridges and Jones (*The Midlands Grazing Industry*, 1931) came to the general conclusions that there was still a considerable demand for big cattle, that it was less profitable to feed cattle that required cake throughout the summer than those that would fatten without cake, and that those cattle were the big cattle. Although their general conclusions were unassailable, it is possible that the difficulty met with on this farm in marketing older cattle has become more noticeable on other farms. Evidence of this tendency is afforded by the widening difference between the prices for good young store cattle and good older cattle in 1936. It is, therefore, of interest to re-examine the evidence Bridges and Jones quote, in so far as it relates to cattle under 3 years. When such cattle were bought in forward condition, they gave bigger profits when caked throughout than when not caked. When they were bought in lean or fair condition, they gave a much lower profit when caked throughout than when not caked. The farms on which these cattle were caked, however, charged a much higher rate of "other expenses" and either bought or sold less advantageously, than those on which the cattle were not caked.

It is possible, therefore, to derive from that survey the conclusion that the results on the farm under discussion, where caking has been practised, may have been fairly representative of those on other farms handling cattle of under 3 years of age.

The carefully kept accounts of the farm have been analysed and the purchased foods and hired keep used by the various

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livestock have been charged against them. All the expenses specifically incurred on poultry, and a share of rent and general expenses, have been charged to the poultry. The remaining expenses—labour, horse costs, manures, tradesmen's bills, rental value and other general expenses—have been apportioned year by year against the other livestock in proportion to the "livestock units" involved and the value of the produce sold. The charge includes no allowance either for the owners' work or for interest of any sort even though interest has been paid. Valuations of the cattle were made each year on the basis of cost-to-date. The "gross profits," which are referred to later, are made up of the excess of sales over purchases, plus or minus the amount by which the value at the end of the year was greater or less than the value at the beginning. In this statement, purchase prices are costs on the farm, and selling prices are usually net price received at the market or butcher's. Live-weights at purchase are estimated live-weights, while live-weights at sale for cattle sold on the hoof are usually actual weights, and those for cattle sold by carcass weight are estimates based on 64 lb. carcass weight per live cwt.

If the subsidy received is ignored, in these eight years the 1,208 beasts sold, weighing 12,881 cwt. live-weight, have left a "gross profit" of 95s. 1d. per head, or after allowing for foods and hired keeping, 34s. 4d. per head towards the cost of grazing and general expenses. As the share of these costs has amounted to 55s. 8d. per head, there has been a net loss of 21s. 4d. per head, or 2s. per live cwt. The subsidy received in the last seven months of 1934-35 gave a welcome increase of £267 to income, but as the existence of the subsidy had not affected expenses during the period under consideration it has not been included in this statement. It represents 50s. 5d. per head of the 106 cattle subsidized, and is equivalent to 5d. per cwt. on all cattle handled during the eight years.

TABLE 1.
Summary of Financial Results from Feeding Cattle, 1927-35.

	<i>Total</i>	<i>Per head sold</i>
	<i>£</i>	<i>s. d.</i>
Gross profits (apart from subsidy received) ..	5,744	95 1
Cakes and meals and hired keeping	3,672	60 9
Share of other expenses	3,361	55 8
Total expenses	7,033	116 5
Net loss	1,289	21 4

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Every year the cattle have left a surplus above the cost of purchased foods and hired keep, but in only one year, namely, 1928-29, the year of Bridges' and Jones' inquiry, has the surplus been big enough to cover a fair share of the other expenses. In that year, the cattle gave a profit of 1s. 7d. per head against the losses of from 3s. 7d. to 5s. 7d. per head in the other years. It is significant that 1928-29 was the only year in which the average selling price per cwt. exceeded the average cost per cwt. at purchase, whereas in other years the original cost price per cwt. varied from 1s. 8d. to 10s. more than the selling price per cwt. The unweighted average, year by year, of the selling price that would have just covered all expenses, allowing for all risks of loss from which this farm actually suffered, but charging no interest and nothing for unpaid labour, was 43s. 5d. (varying from 35s. 1d. to 51s. 11d.) against an average cost at purchase of 45s. 2d. (varying from 36s. 5d. to 51s. 5d.). In other words, on this farm, cattle could have been sold for 1s. 9d. less per cwt. than they were bought for if the only object had been to clear expenses. Unfortunately, however, actual selling prices averaged only about 41s. 3d. (from 34s. 9d. to 47s. 4d.) and so the loss of about 2s. per cwt. arose. If general expenses had been constant from year to year, the costs would only have varied from 35s. 10d. to 50s. 11d.

In the absence of evidence as to costs of rearing, the statement in the Report of the Council of the National Farmers' Union (*N.F.U. Year Book*, 1936, p. 342) that "breeders of store cattle hold that if their industry is to be remunerative, the index figure should be round about 120" may be taken as indicating the figure that would give a profit to them. On this farm, such an index figure would be equivalent to about 46s. 6d. per cwt. delivered. If, in each year, the cost of stores had been adjusted to the price apparently equivalent to a price index of 120 at the time of purchase, and 30s. per head had been allowed as a fair profit to the grazier, to cover interest, unpaid labour, and all risks of any sort from which this farm did not actually suffer, "profitable" selling prices would have varied from 43s. 3d. to 54s. 7d. (see Table 3) and would have averaged 47s., which is equivalent to 47s. 8d. in the auction ring. If general expenses had been constant, the variation would have been only from 43s. 2d. to 53s. 7d. This result is rather different from the popular view that the grazier needs a margin of 5s. per cwt. between buying and

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selling prices, but it does not follow that for a shorter feeding period, it would be possible to make the given profit of 30s. per head if selling prices and buying prices only differed by 6d. It may be pointed out that, on this farm, a rise or fall in the cost of stores of 5s. per cwt. represents a rise or fall in the cost of fat beasts of about 3s. 6d. per cwt.

As the very informative graph in the Ministry's *Agricultural Statistics*, 1934, Part II (p. 116), shows, in the profitable year (1928-29) the fall in selling prices at the usual selling period had not commenced, but store prices had been relatively low. The years of biggest losses per cwt. (expenses being constant) were 1929-30, 1930-31 and 1932-33, all three being years in which cattle died and in which the cattle sold had been relatively dear when bought.

Even though most of the cattle sold from the farm are of good quality and many are of breeds reputed to be better than Shorthorns, the prices actually realized, in the months from August to December inclusive, for beasts sold on the hoof, were often lower than those quoted in the Ministry's statistics year by year for second grade Shorthorns. On the other hand, in the other months, when the supply of cattle in the Midlands is relatively short, and fat beasts are brought into the area from East Anglia, the prices realized were about 1s. to 3s. 6d. per cwt. higher than those quoted in the Ministry's statistics. The same trend was apparent for cattle sold by carcass weight, but on the basis of 64 lb. per live cwt., which was the figure for several groups that were actually weighed both on the hoof and as carcasses, prices per cwt. were always considerably higher than those for cattle sold on the hoof, monthly averages ranging from 1s. 9d. to 6s. 10d. higher—a difference due in part to the fact that the cattle sold on the hoof had to bear commission at about 8d. per cwt. and were usually larger, though not necessarily less well finished, than those sold by carcass weight. Apart from the advantages of direct purchase, it is possible that the lower prices at auction are due to the buyers' estimates that beasts will kill at less than 64 lb. per live cwt. During the foot-and-mouth disease outbreak of 1933 the advantages of having established direct sale were great. The farm has rarely used the Ministry's scheme for sale by dead-weight. The Tables give much additional information with regard to cattle.

The Sheep. The sheep results, shown in Tables 2 and 4, are brighter than those of cattle; indeed, it is from the sheep

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and poultry that the farm has provided a livelihood for the owners. Whereas, for cattle, the pre-1926 policy of breeding and rearing young stock had been unremunerative, the profitable results for sheep are in part due to the maintenance of a breeding flock.

In the first three years with which this account is concerned, a flock of just over 200 breeding sheep was kept, a large but decreasing proportion of the lambs being sold in one lot in July or August. Signs of sheep sickness having appeared, it was decided to reduce the 1930 breeding flock to 70, and to buy in from 200 to 300 lambs (or tegs) in the late summer.

After two years the flock was raised to about 100. In order to rest the land and to leave more keep for the cattle, some of the sheep were sent to winter keeping in the years 1929-30 to 1933-34. The only summer keep hired was three-months for the ewes after weaning in 1932.

In the eight years only 118 theaves were reared into the breeding flock and all of these had been bought as lambs, for the home-bred lambs are worth more for sale to the butcher than they are as potential breeders. On the average, the ewes and theaves have been kept for a crop and two-thirds each, but the length of stay, the ages, and the breeds, of the ewes have varied considerably.

The 1927 lamb crop was produced from a flock containing 17 per cent. of Kerry Hill ewes, 47 per cent. of Masham-cross theaves and 36 per cent. of Border Leicester theaves. In the same year 27 per cent. of these were sold, the ewes depreciating 15s. a head and the few theaves sold actually appreciating by about 2s. 3d. per head above their purchase price in 1926. The lambs that survived to tailing represented 142 per 100 ewes sent to ram, against an average for the eight years of 136 per cent. For the 1928 crop, 53 Welsh ewes were bought cheaply and a few theaves were reared into the flock, the remainder of the flock being sheep kept on from 1927. Most of the Welsh ewes were sold in the following summer, appreciating by 6s. 3d. per head, but having given only 66 per cent. of lambs. The other ewes sold, chiefly double theaves, realized prices about 15s. 8d. higher than their cost in 1926. The 1929 crop was bred from a flock consisting of 110 Clun ewes which had cost about 59s. 4d. and of 100 older sheep, most of which had already given two or three crops on the farm. After this crop, which suffered from the severe frost of 1929, the decision was taken to reduce the

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flock, only 71 of the Clun ewes being retained. The 114 ewes sold made 53s. a head, representing a depreciation, in from one to three years, of from 3s. to 6s. per head.

The remaining Clun ewes were all sold out in 1930-31, after giving another crop, of 149 per cent., at a depreciation of 9s. 8d. in the two years.

The 1931 crop was bred from Kerry Hill ewes, which, having previously had about three crops, were bought at 55s. 6d. and were sold at 43s. 7d., a depreciation of about 12s. per head after one crop of 133 per cent.

The flock was now brought up to 104 by the purchase of Masham theaves at 56s. and the introduction of a few Hampshire cross theaves bought as lambs. Most of these were sold after a 125 per cent. crop, for 33s. 1d. per head, representing the biggest depreciation (23s.) experienced; for it happened that they were all sold when the price indexes for both fat and store sheep were almost at the lowest point ever recorded. It is noteworthy that 1932 was the only year in which no ewes were prepared for sale before September.

For the next crop (1933), the flock consisted in part of Masham double theaves, and in part of local cross theaves bought as lambs. The crop was good and the few theaves and double theaves sold made slightly better prices than in the previous year. The 1934 crop was bred from a mixed flock made up of theaves and double theaves; but it was successful in that the crop, of 140 per cent. of lambs, sold well and the double theaves made prices well above cost. In general the relatively small depreciation of 5s. 1d. per crop (true average) on the breeding flock is due to pushing the dams forward for sale with, or soon after, the lambs.

The rams most favoured have been Hampshires, that breed alone being used for all the crops of 1930 onwards. Shropshires, a Kerry Hill, an Oxford and a Western, as well as Hampshires were used in the earlier years. Lambing normally commences about the third week in January.

Most of the lambs bought for fattening as tegs have been either pure Kents or Southdown × Kent crosses, bought in July, August or September. In 1930-31, 214 Suffolk and Oxford × Border Leicesters were obtained locally, as were all the lambs bought in the following year. Those bought at the very low delivered cost of 14s. 7d. in 1932-33 were pure Kents. The higher average price in 1933-34 was in part due to buying about 25 per cent. of these lambs in November

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instead of August, at prices 8s. higher than those of August. In the two previous years, falling prices for fat sheep had discouraged buying, and prices had not shown the normal rise for the cost of store sheep in general, between August and November. In this year, 1933-34, improving prospects had led to a return to the normal trend.

The breeding flock receives liberal rations from December or January to April or May, rising from about $\frac{3}{4}$ lb. to 2 lb. per ewe of mixtures of beet pulp, ground-nut cake, bran and maize meal. The tegs also are hand-fed at rates of about $\frac{1}{2}$ lb. per head during the winter and early spring.

The financial results, calculated in the same way as those for fattening cattle, are shown in Table 2. In what follows "per head" means "per head excluding ewes" unless a note to the contrary is made. The number of sheep sold apart from ewes was 2,609.

TABLE 2.
Summary of Financial Results from Sheep, 1927-35

	<i>Total</i>	<i>Per head sold</i>
	<i>£</i>	<i>s. d.</i>
Gross profits, including credits for wool ..	4,255	32 7
Foods and hired keeping	1,119	8 7
Share of other expenses	1,564	12 0
Total expenses	2,683	20 7
Net profit	1,572	12 0

If other expenses had been constant, the sheep would have left a net profit in each year except 1932-33. Those profits fit very closely the course of prices indicated by the Ministry's Index for fat sheep prices, when allowance is made for the proportion of store sheep bought and the level of prices when they were bought. Indeed, if selling prices had been those corresponding to the average index number, 138, and other expenses had been constant, all the years would have shown profits exceeding 9s. per head, except 1930-31 and 1931-32, which were years in respect of which many store sheep were bought when store prices were high.

An analysis of the prices and a comparison with those quoted in the Ministry's Statistics is not possible because only rarely were weights of sheep noted at sale. The prices recorded are the amounts actually received, usually involving a commission of approximately 8d. per head. A varying number, especially in the early part of the season, are sold direct to a butcher.

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In the years since the purchase of store sheep commenced, the best financial results have been obtained when a big proportion of the fat sheep, mostly lambs, have been sold in April or May, when prices are normally at their highest, although this involves extra feeding.

The years of poorest profits were those in which wool prices were at their worst. Indeed, in 1932 no acceptable bid could be obtained. Again, in 1934, the market broke before the country buyer to whom the wool was normally sold, unwashed, could call at the farm, and, as in 1932, the wool remained on hand for sale with the following year's crop. From 1930-31 onwards the wool has included from 65 per cent. to 80 per cent. of non-ewe fleeces.

The health of the sheep has not been as good as that of the cattle, and a considerable number of deaths occurred in 1932 and 1933, apparently due to parasitic gastritis.

The Tables help to form a basis for estimating the extent to which the total profit from sheep has been affected by the size of the ewe flock (limited by disease considerations), the yield of lambs, the depreciation of the ewes, the value of the wool, the proportion of lambs sold early, the quantity and price of foodstuffs used, the share of other expenses (including labour and grazing), the purchase and selling price of sheep.

Summary. On this grazing farm, where expenses, apart from foodstuffs, are lower than on many farms, and stocking in June reaches about 3 steers and $4\frac{1}{2}$ sheep, as well as about 16 hens and as many young poultry, to every 4 acres of the farm, fattening cattle have produced gross profits which have exceeded the cost of purchased foods and hired keep by about 3s. 2d. per live cwt. sold during 8 years. As their share of all the other expenses of the farm have amounted to about 5s. 2d. per cwt., they have left net losses of about 2s. per cwt. A net selling price of 47s. per cwt. would, on the average, have provided for the purchase of store cattle at a price profitable to the breeders, and have left a profit of 30s. per head for the grazier. Actual annual prices only once reached 47s. and only averaged 41s 3d.

A preliminary analysis of the accounts for 1935-36 shows that prices, excluding subsidy, fell to an average of 32s. 5d.

On the other hand, sheep have, despite losses in 1931 and 1932, provided an average net profit of about 12s. per head of non-breeding sheep sold.

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TABLE 3.—DETAILS AS TO FEEDING CATTLE, YEAR BY YEAR

	Year commencing March 25									
	1927	1928	1929	1930	1931	1932	1933	1934		
Number of cattle sold	110	119	154	197	174	128	139	187		
Number dying or sold for only a few shillings	1	0	3	2	0	1	0	0		
Estimated liveweight at purchase (cwt. per head)	8.4	7.8	6.8	7.6	8.1	7.5	7.5	6.9		
Liveweight at sale (cwt. per head)	11.13	10.65	9.90	10.68	10.85	11.20	11.21	10.08		
Time on hand (months)	7.4	8.4	9.1	8.1	7.0	10.3	9.6	8.1		
Proportion sold August to December (per cent)	75.0	65.0	45.0	56.0	72.0	66.0	81.0	73.0		
Foods fed per head per day (lb.)	2.3	2.6	3.7	3.7	1.8	2.3	3.0	5.3		
Cost of foods per cwt. (s. d.)	9/4	10/9	9/2	6/-	6/6	7/3	6/5	5/8		
Cost of foods per live cwt. of beast sold (s. d.)	4/9	6/-	8/10	3/10	2/4	4/3	4/6	4/6		
General expenses charged per live cwt. of beast sold (s. d.)	8/2	7/-	6/6	3/9	4/11	5/1	4/7	3/8		
Net profit (+), or loss (-), per head sold (s. d.)	-51/7	+ 1/7	-45/6	-20/7	- 8/10	-42/4	-10/7	- 3/7		
Cost per cwt. as stores (s. d.)—liveweight estimated	47/6	44/4	49/11	51/5	45/1	47/-	39/7	36/5		
Total cost of finished beast (s. d. per cwt. sold)	48/3	44/11	51/11	47/1	42/1	40/10	36/11	35/1		
Actual selling price (s. d. per cwt. sold)	43/8	45/-	47/4	45/2	41/4	37/-	36/-	34/9		
Annual average price for 2nd quality fat Shorthorns (calculated from Agric. Statistics, Part II)	44/-	47/9	46/1	44/6	41/9	38/7	34/6	33/3		
Ministry's price index for store cattle when the cattle sold were bought	125	123	121	125	124	121	105	89		
Ministry's price index for fat cattle when the cattle were sold	120	125	121	130	122	108	100	99		
" Profitable price "—see text of article	49/4	46/11	54/7	48/5	43/9	43/3	43/4	46/9		

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TABLE 4.—DETAILS AS TO SHEEP, YEAR BY YEAR

	Year commencing March 25							
	1927	1928	1929	1930	1931	1932	1933	1934
Number of sheep sold, excluding ewes	267	308	302	452	299	231	403	347
Number of ewes mated in previous autumn	190	205	210	71	76	104	108	110
Number of lambs tailed	271	283	301	106	101	130	158	154
Number of deaths : ewes	6	12	9	6	5	3	5	1
others	6	0	14	10	4	19	33	4
Lambs bought : number	0	13	230	353	210	231	238	0
cost per head (s. d.)	—	34/11	48/4	44/2	29/8	14/7	18/8	—
Lambs sold : number	265	295	294	175	73	109	171	153
price per head (s. d.)	38/7	42/5	45/6	53/1	47/10	33/9	30/2	39/11
Average selling price of all sheep, excluding ewes (s. d.)	38/7	43/1	46/1	61/9	54/6	37/-	36/3	47/4
Ewes and theaves bought : number	53	120	0	75	88	0	34	30
cost per head (s. d.)	29/1	58/6	—	55/6	56/-	—	28/3	47/2
Ewes and theaves sold : number	49	115	114	71	63	86	21	69
price per head (s. d.)	39/3	58/5	53/-	49/8	43/7	33/1	35/6	43/7
Wool : number of fleeces	206	209	178	262	260	310	287	252
weight per fleece (lb.)	5.9	?	6.6	7.2	6.4	(7.2-7.2)	?	?
price per fleece (s. d.)	7/5	6/11	4/4	3/5	4/1	1/3 (Valn.)	3/6	2/4 (Valn.)
price per lb. (pence)	15.1	?	8.0	5.7	7.7	(5.7-5.7)	?	?
Foods fed to all sheep (lbs. per head of all sheep per day)	0.18	0.35	0.35	0.36	0.39	0.32	0.43	0.39
Cost of foods per cwt. (s. d.)	8/8	9/3	8/3	5/11	6/-	7/2	6/10	6/4
Cost of foods to all sheep (s. d. per head, excl. ewes, sold)	5/7	9/7	10/10	4/9	7/9	12/2	8/1	3/5
General expenses charged (s. d. per head, excl. ewes, sold)	14/7	14/5	10/11	8/7	15/6	17/7	8/10	10/-
Net profit (+), or loss (-) (s. d. per head, excl. ewes, sold)	+20/5	+24/-	+18/6	+9/8	-1/9	-5/5	+10/-	+18/5
Ditto, if general expenses per year had been constant	+20/4	+25/9	+16/6	+9/7	+0/8	-4/9	+9/2	+17/2
Ministry's price index for fat sheep when the sheep were sold	145	165	155	161	137	96	112	133
Ministry's price index for store sheep when the fat sheep sold were bought	145	154	—	165	164	127	90	85
Net profits (+), or losses (-), if expenses had been constant and selling prices had been those corresponding to Ministry's Index 138 (s. d. per head sold)	+18/-	+15/1	+9/3	-0/4	+1/2	+17/8	+18/1	+19/3

SOME GRADING RESULTS AT AN EASTERN COUNTIES BACON FACTORY

A. W. PUNTER, B.Sc., N.D.A., N.D.D.

At the annual inspection of the plots at Saxmundham Experimental Station, a lecture and discussion on pig problems was arranged. A contribution was made by the staff of Messrs. Harris (Ipswich), Ltd., Bacon Factory, discussing the various grading results, which were illustrated by a chart. The chart had been shown previously on stands at various shows and raised a considerable amount of interest among producers. The chart appeared to contain so much valuable information as to make it worthy of wider publicity, and this has now been made possible by the courtesy of the firm.

The object of the chart in the first place was purely educational, and intended to show producers with poor grading results that some producers were actually doing much better, and that the Grade "A" pig was not a mythical animal.

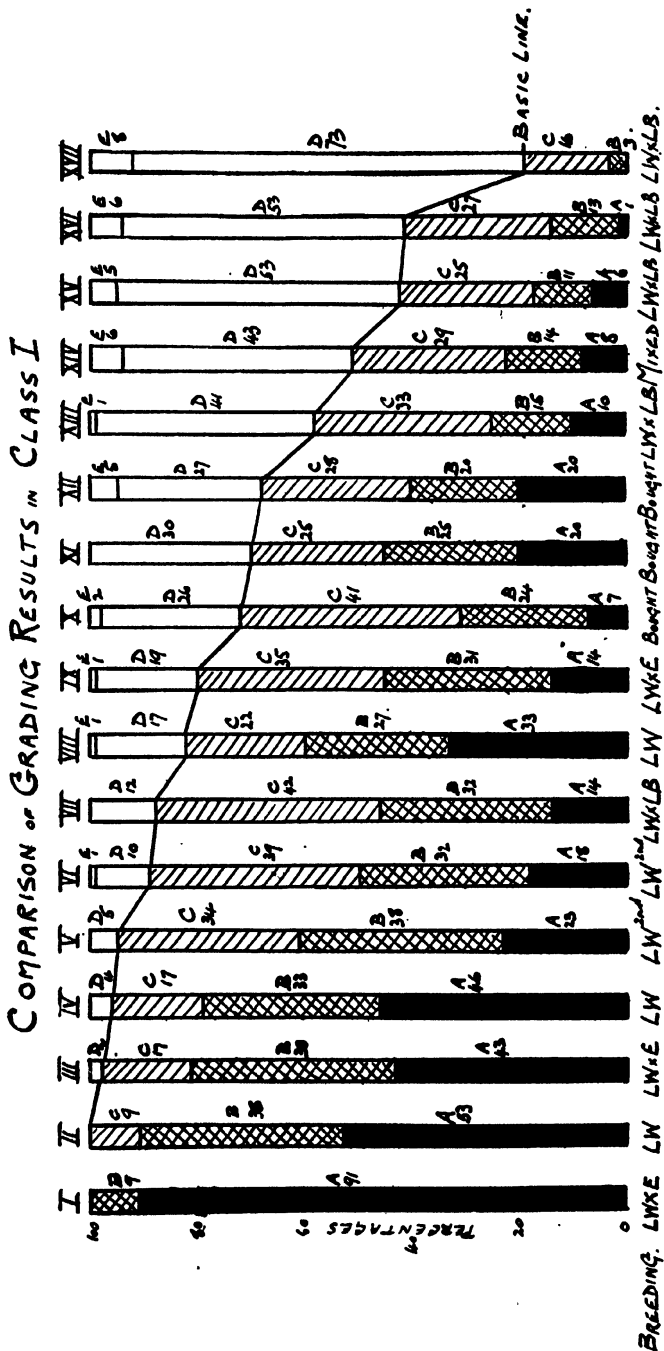
The chart refers only to Class 1 pigs, each column representing the pigs from a single producer for the same part of a year. The letters beside the columns show the grading of the pigs and the figures below the letters show the percentage of pigs in that Grade. The results are taken from producers in the Eastern Area only.

The figures below the columns show the percentage of pigs of basic and bonus grade delivered under contract. The average in these grades for all producers is about 50 per cent., so that, on the chart, more high than low gradings are represented, but this is done in order to emphasize the better results. The percentage of basic and bonus grade pigs of producers represented on the chart descends from 100 to 19 per cent., but there are results on record as low as 4 per cent.

After the columns representing the different producers had been prepared, it was decided to attach information about breeding to see if anything could be learnt from this. The object was not to boost any particular breed but to obtain any information that could be passed on to the producer to his advantage.

A study of the chart shows that all the best grading results are obtained from herds using Large White boars and mating

GRADING RESULTS AT A BACON FACTORY



PERCENTAGE OF FIGS BASIC & UPWARDS.

Chart showing comparison of Grading Results in Class I Figs.

GRADING RESULTS AT A BACON FACTORY

with either Large White, Essex, or Large White first-cross, sows. There is one herd of Large Black sows mated with Large White boars which shows 88 per cent. basic and bonus grade pigs, but this is exceptional; and this cross is generally found amongst the lower grading ones. The writer has had access to the records of many other producers and is satisfied that the chart is representative and typical of the varied grading of the several hundred contracts held by the factory.

The results suggest that the Large White should be the sire of every bacon pig, and although a suitable strain of pure Large White sow will give good grading results, very satisfactory results can be obtained by using Essex, or Large White first-cross, sows.

The importance of strain within the breed is emphasized by the fact that there have been instances in which pure bred Large Whites have given less than 10 per cent. basic and bonus grade pigs, despite the fact that they came from herds with good show records; and the same can be said of other breeds.

A study of many records of producers who buy stock in the open market shows that when they buy and send all to the factory without selection they usually grade below or about equal to the average of all pigs sent to the factory. If, however, producers select the most likely looking pigs when buying, and only send the most suitable to the factory, considerably better results can be obtained, as is shown by columns X, XI and XII of the chart.

It is interesting to see how the conclusions drawn from the chart are borne out by the results of bacon competitions held at the last Dairy Show. The open competitions were all won by Large Whites, and the Bledisloe Cup for first-cross bacon by Large White \times Essex, while the animals taking 2nd and 3rd places had a Large White parent.

The chart does not take into account anything but grading and breeding. No account is taken of feeding or the ability to produce large, well-grown litters. It is well known that feeding and management greatly affect grading, but it is unlikely that any particular breed amongst several hundred producers will be specially favoured in these respects. It is also important to have large and well-nourished litters to make bacon production profitable. It is not much use having a sow that does not breed regularly and produces only a few pigs, even if these grade well. The chart, therefore, gives

GRADING RESULTS AT A BACON FACTORY

pretty conclusive evidence regarding the boars to use, but does not give the same evidence about sows. This can only be obtained by litter recording, which must be carried out by anybody who hopes to make pig keeping profitable.

Management and Feeding. As a supplement to the information contained in the chart, a study was made of the systems of management and feeding of some of the producers concerned and is given below.

Column II of Chart. This herd of pedigree Large Whites has only been formed a few years, and has the advantage over some old-established pedigree herds that all pigs have been selected for bacon production under the present grading system of the Marketing Scheme. Pigs have done well in the show ring as well as at the bacon factory.

The herd consists of about 60 breeding sows which, after service, are out at grass until about a fortnight before farrowing, and while at grass get about 4 lb. of meal per day. The meal is put into troughs dry and water is poured on it to stop wastage by the action of wind. Boars are not run loose with sows, the sows being taken to boars when ready for service.

The sows farrow indoors, but 3 weeks later the sows and litters are put into folding units with runs and creeps attached. The stores are put into a Danish type of fattening house to hold 350 pigs, and here they remain until ready for the factory.

There is a contract for 400 pigs with the local bacon factory. All pigs are ear-marked and weighed at weaning and at intervals thereafter. Records are kept of litters, numbers born and reared, food consumption, grading at factory and other particulars that may assist in the selection of breeding stock.

The ration for all stock except baconers consists of the following mixture:—

Weatings	..	..	..	..	40 per cent.
Barley meal	..	..	..	..	20 "
Flaked maize	..	..	..	..	20 "
Bran	..	..	..	..	10 "
Fish meal	..	..	..	..	10 "

For baconers the ration is as follows:—

Weatings	..	..	..	..	30 per cent.
Flaked maize	..	..	..	..	30 "
Barley meal	..	..	..	..	30 "
Soya bean meal	..	..	..	..	10 "
Mineral mixture 2 lb. per cwt. of meal.					

GRADING RESULTS AT A BACON FACTORY

Baconers are allowed as much as they will clear up, until they reach an amount of 6 lb. per head, which is not exceeded. They reach this amount at about 5 months, and are ready for the factory at about 7 months old. The average litter is between 8 and 9; at weaning the average weight per pig is about 30 lb.

As a result of this careful breeding and management 50 per cent. of Grade "A" and 100 per cent. basic and upwards are being produced.

Pigs from the herd are in great demand by other producers for grading up purposes.

Column VII of the Chart. This herd consists of 40 to 50 Large Black sows which are mated to Large White boars. The owner is now convinced that a larger proportion of Large White blood is likely to give better grading results, and is selecting from his first-cross gilts for breeding with a Large White boar. The type of Large Black sow in this herd is much above the average of Large Blacks for bacon qualities, as they have been selected for some years with the object of producing good bacon carcasses. The type of boar used is such as to help in counteracting the "too-fat" tendency of Large Blacks.

Sows are at grass till a fortnight before farrowing, when they are brought into farrowing pens but still allowed out in the daytime for several days. The average number weaned to date is $9\frac{1}{2}$ per litter. They are not weighed at weaning but at frequent intervals after about 140 lb. live-weight. All pigs are ear-marked and records are kept, so that grading results can be watched for each sow's and boar's progeny.

The ration for all stock except baconers is as follows:—

Weatings	..	..	..	..	34 per cent.
Barley meal	..	..	..	..	28 "
Flaked maize	..	..	..	..	18 "
Bran	..	..	..	..	13 "
Fish meal	..	..	..	..	5 "
Mineral mixture	..	..	..	..	2 "

Sows at farrowing time get some extra bran. The stores go on to baconers' ration at 14 weeks. This ration is as follows:—

Weatings	..	..	..	..	50 per cent.
Barley meal	..	..	..	..	35 "
Flaked maize	..	..	..	..	12 "
Fish meal	..	..	..	..	3 "

GRADING RESULTS AT A BACON FACTORY

Fish meal is fed right up till sending to the factory. Young pigs are never at grass, but a small amount of greenstuff is given to all pigs daily. It has been found very important to restrict rations to $5\frac{1}{2}$ lb. meal as a maximum in order to get good grading results; otherwise this cross tends to put on too much fat. In very cold weather food is mixed with warm water, which has been found a great advantage.

A Third Producer's Methods. Another producer whose methods were studied has had 100 per cent basic grades and upwards during the past year. Here again, the breed is pure Large White. This producer has been breeding for bacon production for some years, during which time he has had several strains, but has now fixed on one particular strain by line breeding, and it is by this method of breeding that such satisfactory results are obtained. It is, of course, very important that after the breeder has evolved a suitable line of breeding sow stock he should maintain the type by use of suitable boars. The pigs on this farm are a specialized branch of a general mixed farm, and there is no elaborate housing, but ordinary farm buildings and barns are utilized for the different classes of stock.

The ration for breeding stock and young pigs is as follows:—

Weatings	..	..	..	..	60 per cent.
Flaked maize	..	..	..	..	15 "
Wheat meal	..	..	..	..	15 "
Fish meal	..	..	..	..	10 "

and for baconers:—

Weatings	..	..	..	..	45 per cent.	
Barley	..	..	..	..	25	} Ground together at farm.
Beans	..	..	..	..	$2\frac{1}{2}$	
Wheat	..	..	..	..	$2\frac{1}{2}$	
Flaked maize	..	..	..	..	20	
Fish meal	..	..	..	..	5	

This is fed as a stiff mash, and pigs are allowed water to drink. All pigs are allowed as much as they can clear up in ten minutes. In all these very successful pig farms, the pigs are treated as a specialized branch. Records are kept of all pigs, so that the right type of breeding stock only is used, and suitable food is strictly controlled so that too much bulk or quantity of meal is not given. A study of farms at the other end of the chart shows no such specialization and care.

ELECTRICAL HEATING OF SOIL IN FRAMES

CHARLES P. QUARRELL, B.Sc. (Hort.).

ONE of the problems facing growers of early market-garden produce is that of providing an efficient substitute for horse-manure or other organic substance, used to make hot-beds for frames, etc. The possibility of utilizing electric power for this purpose has interested many scientists and progressive growers; and considerable work has been done on the subject.

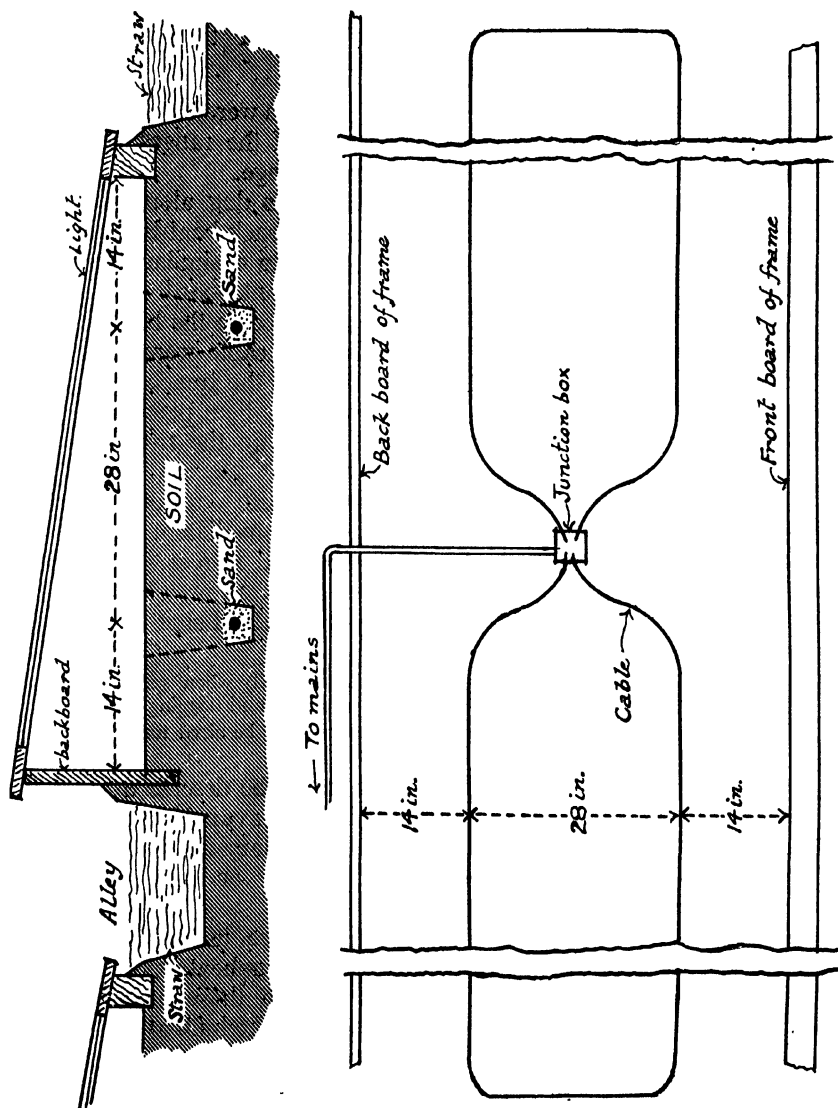
Mr. F. A. Secrett, who is well known for his pioneer work and up-to-date methods in intensive market-garden practice, decided to investigate the matter and to carry out an experiment on a commercial basis. Accordingly, an experiment was planned and conducted at Holly Lodge Farm, Walton-on-Thames, during January and February of 1935. The writer was placed in charge of the experiment and herewith records his own observations and notes on it. While the results are not spectacular, it is thought that a report may be of some value in view of present day interest in the subject.

The electrical equipment was supplied and installed by Messrs. Callender's Cable & Construction Co., Ltd., of Erith, under the direction of Mr. A. Metcalf, M.Sc.Tech., A.M.I.E.E., and Mr. G. S. Boothroyd. The cable supplied was of a new type especially manufactured for soil-heating. This cable is the outcome of considerable research work conducted by the firm on this subject; and it claimed that, using the technique of soil-heating developed by Messrs. Callenders, a higher temperature can be obtained with a given power consumption, than has hitherto been possible.

The object of this experiment was to ascertain whether soil-heating by means of electricity could be satisfactorily achieved at an economic price when conducted under commercial conditions.

Materials. The soil was a light silty-sand which had been well manured for a previous crop. The frames were ranges of Dutch lights (41 lights per range). The beds were "raised" by casting up soil from the alleyways, which were 18 in. wide. The tops of the lights rested on boards 9 in. by 1 in. and the bottoms on 4 in. by 3 in. timber (quartering). The lights fitted closely together with no "runners" or

ELECTRICAL HEATING OF SOIL IN FRAMES



Plan and Section of Frame showing Layout of Electrical Cables.

ELECTRICAL HEATING OF SOIL IN FRAMES

intervening boards dividing the range into compartments such as are present in the English type of frame.

The cable specification was 15 yd. length of 400 watt standard Callender Soil-heating Cable; and the current supply was from 230 volt A.C. mains.

Cable Installation. The main supply leads were conducted through conduits along the back-boards of the ranges and connected to two junction boxes in each range.

A trench, 2 in. wide and 9 in. deep, was dug along the ranges at a distance of 14 in. from the back-boards and parallel to it. This trench was connected to a similar one, which ran 14 in. from and parallel to the front board.

A layer of coarse sand 1 in. deep was placed in the bottom of the trenches. Single loops of the special cable were then connected to the junction boxes and laid in the trenches on top of the sand. A further 1 in. of sand was then placed on top of the wire and the soil returned to fill up the trenches (see Section, p. 447).

The beds were then prepared by raking, etc., carrot seed (var. Broadcast) was sown broadcast, and immediately afterwards young lettuce plants (var. Gotte à Forcer, sown October 12, 1934) were planted out at 11 in. × 10 in. apart.

The Dutch lights were then put on and remained shut down at all times excepting:—

- (1) On very sunny and warm days (about April) when some air must be given in order to prevent scorching and flagging;
- (2) after sharp night frosts when the frames must be aired for 30 to 60 minutes before the sun shines on them.

The condition of the soil at planting may be described as "very moist," and ample sub-soil water was available.

Straw was placed in the alleyways on February 22, 1935.

No protection against frost (such as straw or mats) was ever placed on the lights.

Seven ranges parallel to one another were used in the experiment. Four were heated; and three, unheated, were "controls," being arranged alternately with those heated. One Fahrenheit thermometer was placed with the bulb at 2 in. depth in the soil inside each of the heated frames and one in one of the "controls."

Temperature readings were taken and recorded daily at 7 a.m., 4 p.m. and 8 p.m. and occasionally at other times.

The current was switched on at 12 noon on February 16, 1935. It was switched off automatically between the hours of

ELECTRICAL HEATING OF SOIL IN FRAMES

4 p.m. and 8 p.m. daily, this being the "peak" time of local electric power consumption (a factor that affected the price per unit). The current was also cut off on three occasions for a few hours on very sunny days.

Experiments with the new cable, conducted by Mr. Metcalf of Messrs. Callender's Cable Co. at their Wood Lane Research Station, but with a different kind of frame and arrangement of cable, showed that under the conditions of that experiment the cable could readily raise the soil temperature to 60° F., and that this temperature was so easily retained that subsequently the current was switched on only during the night and on exceptionally cold days. This objective was not obtained under the conditions of the experiment at Walton-on-Thames. The temperature of 60° F. was obtained only on days that were relatively hot for the time of year, and the day-night fluctuations were considerable, and were as wide in the heated frames as in the "controls."

These rather disappointing temperature results—as compared with the manufacturer's findings—may be accounted for as follows:—

- (1) The absence of a thermal insulative layer below the cable: the usual 6-in. to 12-in. layer of coke for this purpose was impracticable because the coke would interfere with subsequent cultivations after the frames were taken down, and would tend to dry out the beds. (Note: this system of cropping does not permit of watering while the lettuce are in the frames.)
- (2) No special wind-breaks were provided at Walton for this experiment.
- (3) The cables at Walton were probably laid at too great a depth.

Notes on Temperature Readings. When the current was switched on, the temperature of the soil at 2 in. depth in the ranges was 50° F. The average difference in soil-temperatures between heated and "control" frames was 5° F., but on very sunny days this difference increased to 10° F., returning at night to the usual 5° F. difference. The maximum temperature attained in the soil of heated frames was 67° F., and the maximum in the "control" soil was 57½° F. The minimum temperature in the heated frames (while the current was on) was 46° F. compared with the minimum in the "control" range of 41° F.

On March 5, it was decided to cease heating the frames, and the current was therefore switched off. Readings were taken and recorded for a few days afterwards, and by March 11, the thermometers in the "control" and heated ranges

ELECTRICAL HEATING OF SOIL IN FRAMES

registered equal temperatures. From the figures obtained, it was calculated that during the time heat was applied, one unit of electricity was consumed to produce one lettuce (disregarding the carrots).

The probable disadvantage of automatically switching off the current between the hours of 4 p.m. and 8 p.m. should be noted.

Notes on Crop Behaviour. The carrot seed (sown on February 14, 1935) in the heated frames germinated about two days before those in the "controls."

The lettuce plants (planted February 14, 1935) in the heated frames showed slightly advanced growth compared with those in the "control" frames on March 5, the date on which heating ceased. By March 14, this difference was very marked, although no heat had been applied for 9 days.

The majority of the carrots in the heated frames had reached the "rough leaf" stage of growth on March 7, while those in the "control" ranges were only in the "cotyledon" stage. All the lettuce plants and carrot seedlings remained free from diseases or pests until just before the lettuces were fit to cut, when a very slight attack of green-fly was observed in both heated and "control" ranges.

Under the conditions of this experiment it was unfortunately impossible to make accurate records of crop weights or market-price returns, but the following observations may be of some interest:—

The first "cuttings" of mature lettuce from the heated frames took place on April 2, that is six days before any were cut from the "controls."

A greater percentage of first grade lettuce was obtained from the heated frames than from the "controls." From the packers remarks and the writer's observations, it may be mentioned that the lettuces from the heated ranges were heavier than those from the "controls," particularly those from the first two cuttings from each type of range.

Most of the lettuces cut on April 2 were obtained from near the cable junction boxes. The cables were brought to surface level at this point to connect with the junction boxes, rising from 8 in. depth in a distance of about 3 ft. Thus the cable in this region was much nearer the roots of the plants. The excellent quality and size of these lettuces, combined with the fact that no signs of excessive drying-out of the soil was

ELECTRICAL HEATING OF SOIL IN FRAMES

observed in these regions, seem to indicate the advisability of laying the heating cable in more shallow trenches, say 5 in. depth.

The carrots in the heated and in the "control" ranges were pulled and marketed at the same time and showed no difference in size, colour or quality.

The lack of a thermal-insulative layer beneath the cables was an important defect in the lay-out of the experiment. The usual layer of coke for this purpose was considered impracticable in this experiment in view of its probable interference with subsequent cultivations after the frames were moved to new ground.

Future experiments may reveal the possibilities of alternative materials for thermal-insulation, such as dry peat-moss or dry straw. These materials might remain sufficiently effective for a few months, which would be sufficient for the early forcing of produce. Subsequently, such materials would add to the humus content of the soil and not interfere with cultivations.

In conclusion, although this experiment met with only partial success in respect of commercial application, yet much was learnt in technique, and there is every reason to believe that future experiments will meet with greater success.

Summary. (1) An account is given of an experiment on soil-heating by electricity carried out under commercial conditions at Mr. F. A. Secrett's farm at Walton-on-Thames.

(2) The object of the experiment was to investigate the possibilities of soil-heating by electricity for the production of early market-garden crops under Dutch lights, and on a commercial scale. The crops grown were lettuce and carrots.

(3) Messrs. Callenders Cable & Construction Co. supplied a special cable for soil-heating. It is claimed that, using the technique of soil-heating developed by Messrs. Callenders, a higher temperature can be obtained with a given power consumption, than has hitherto been feasible.

(4) Seven ranges, each consisting of 41 Dutch lights, were used in the experiment; 4 ranges were heated by the cables, and 3 were not heated ("controls"). Heated and "control" ranges were placed alternately.

(5) The cables were laid at a depth of 8 in. below the surface level. The results of the experiment, however, seem to indicate that a depth of 5, or even 4 in. would have been

ELECTRICAL HEATING OF SOIL IN FRAMES

more effective without causing excessive drying-out of the soil.

(6) Accurate records were kept of the soil temperatures at 2 in. depth, in both heated and "control" ranges. It was hoped to obtain and maintain a soil temperature in the heated frames of 60° F. Under the conditions of this experiment, the temperature of 60° F. was reached only on sunny days and was not maintained for any length of time. Further, fluctuations between night and day soil temperatures were considerable in the heated ranges; and after 17 days, heating was discontinued owing to the high current consumption.

(7) In this experiment, it was found impossible to take weight or grade records of the crops accurately. However, observations on weight, grade, and quality were noted and are given, together with remarks on comparative crop behaviour.

(8) Under the conditions of this experiment, electric power for the purpose of soil-heating proved to be too expensive to be of commercial value. If it had been possible to provide thermal insulation for the frames, considerably higher temperatures would have been obtained. Probably the application of soil-heating one month earlier in the year to these crops would give better results, by reason of the higher market prices obtainable. Further experiments are contemplated.

ACKNOWLEDGMENTS.—The writer's thanks are due to Mr. F. A. Secrett, F.L.S., of Holly Lodge Farm, Walton-on-Thames, for permission to publish these data; to Mr. Chapman, production-manager of the farm, for assistance in the supervision of the laying out of the cable and in obtaining records; and to Messrs. Callender's Cable & Construction Co. and their representatives, Mr. Metcalf, M.Sc.Tech., A.M.I.E.E., and Mr. Boothroyd, for their keen interest and invaluable help in planning the experiment.

THE CULTIVATION OF WINTER LETTUCE

H. FAIRBANK, N.D.H.,

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Reaseheath.*

GREATER attention is being paid each year to crops that can be produced under glass in the period between one season's tomato crop and the next. In the north, particularly in Cheshire, such crops as chrysanthemums, bulbs, mint, rhubarb, and, to a lesser extent, mushrooms, have been the rule, but as the number of growers and the area of glass have increased considerably during recent years, and the demand for these various winter and early spring crops has remained stationary, there has been an increasing need for the exploration of other fields of production. Winter lettuce has been tried in many instances, but not always with success. Our own experience at Reaseheath has been typical of that of many other growers.

Trials in 1933-34 of the best varieties then in cultivation suggested that success was most likely to be achieved with Loos Tennis Ball. This variety was accordingly used in the following year, in a house measuring 85 ft. by 28 ft. Seeded in drills in October and thinned to 6 in. apart, it failed to heart in February, and was accordingly marketed in the immature state known in the trade as "butterfly." The whole crop was sold at 2s. 6d. per dozen, realizing over £60. In the following season, the same variety was sown early in frames, and transplanted. This crop was a complete failure owing to an attack of *Botrytis*.

Botrytis. *Botrytis* is known to be a decisive factor in winter lettuce cultivation; and the main control measures open to the grower have been clearly established by Dr. Bewley's work at Cheshunt. They consist in surface sterilization of the soil and maintenance of suitable temperature-moisture balance, a light buoyant atmosphere being a great desideratum. As a further safeguard Bewley recommends that the crop should be looked over daily in order to detect the slightest infection of the leaves. Our own observations suggest that the disease usually starts in the cotyledons. These are difficult to see after the plants have

CULTIVATION OF WINTER LETTUCE

attained reasonable size, and their removal is a tedious process. It would probably be advisable to remove them when transplanting. The progress of the disease is illustrated in Fig. 1.

Cheshunt Early Giant. Following the conference convened by the Ministry at Cheshunt in the spring of 1935, arrangements were made for a comparative trial of Loos Tennis Ball and Cheshunt Early Giant, the method of cultivation being that laid down in Bewley's leaflet.* A steel-framed Dutch aeroplane-house measuring 80 ft. by 32 ft. was used, one half being put down to Loos Tennis Ball and the other to Cheshunt Early Giant.

After the tomato crop had been cleared the ground was deeply dug, thoroughly soaked, and later given a "surface sterilization" with formaldehyde (one gal. of commercial formaldehyde diluted with 49 gal. of water to 60 sq. yd.).

Seed of the Loos Tennis Ball was sown on October 4, 1935, two days after the surface sterilization, in 12-in. drills. A good and quick germination resulted. The plants were later thinned to a distance of 6 in. apart. Thenceforward, the treatment was similar to that given to the Cheshunt Early Giant as detailed below.

Seed of Cheshunt Early Giant was sown thinly in boxes of sterilized soil on October 4, 1935, the plants being pricked out into other boxes when large enough to handle. They were finally planted in the glasshouse in rows 12 in. apart and 10 in. between plants, on November 7.

A temperature of 45°-55° F. was, as far as possible, maintained. Ample ventilation was given whenever conditions permitted.

At the outset, the Loos Tennis Ball seemed to grow more rapidly than the Early Giant, but as the season advanced the position was reversed; by the end of December the Early Giants were considerably the larger plants. During December, the worst possible conditions prevailed, the shortness of the days being accentuated by continual fog. By the end of December, most of the plants showed a marginal discoloration resembling that caused by potash starvation, but probably due to the poor illumination, the plant being unable to assimilate sufficient to maintain the leaf surface built up during the more favourable period experienced earlier. In

* The Cultivation of Cheshunt Early Giant Lettuce in Glasshouses.

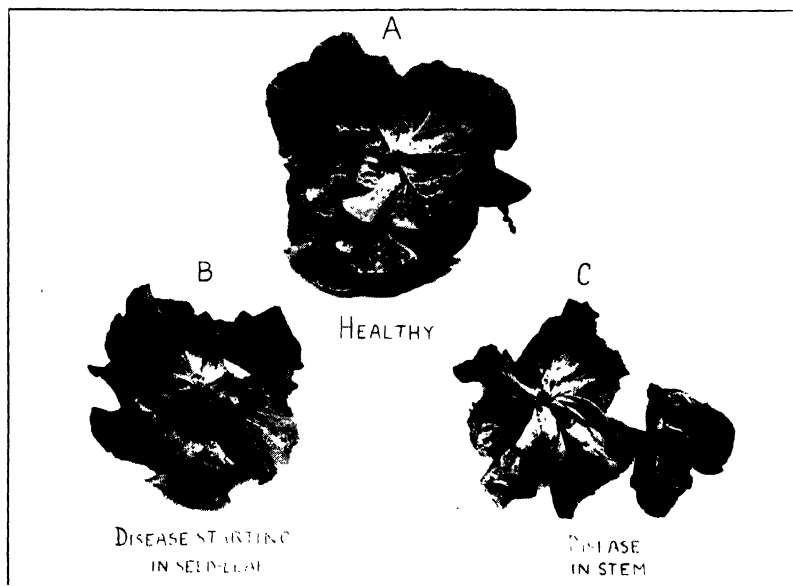


FIG. 1.—Progress of Botrytis in Lettuce.



FIG. 2.—Interior of Greenhouse, showing Loos Tennis Ball on left, and Cheshunt Early Giant on right*

To face page 454.



Cheshunt
Early Giant



French



Loos
Tennis Ball



FIG. 3.—Three Varieties of Winter Lettuce.

CULTIVATION OF WINTER LETTUCE

any case, this defect righted itself after the turn of the year when some sunlight was available.

Watering. As a general guide, Bewley has suggested that winter lettuce should be watered once a week. Under the conditions prevailing during December and January, this procedure did not appear to us advisable, and watering was accordingly restricted. This resulted in rather prostrate, flabby, slow-growing plants. As weather conditions improved in February, weekly waterings were commenced, with immediate and striking improvement in rate of growth and crispness of foliage.

Cutting. Early in February, the Cheshunt Early Giant started to heart. By this time the Loos Tennis Ball had filled their allotted space, though none showed a suspicion of a heart. Both varieties were cleared in February in order to make room for tomatoes. The accompanying photograph (Fig. 3) illustrates the two types under review in comparison with a foreign lettuce on sale in the shops at the time. The weights of these lettuces at the time of the photograph were as follows:—

(a) Loos Tennis Ball	1½ oz.
(b) Cheshunt Early Giant	3½ ..
(c) French	6½ ..

Weight, however, is not the only consideration in winter lettuce; appearance counts for much. The tight-hearted Early Giant was fresher, crisper and altogether more attractive in appearance than the imported lettuce. The returns are given in the accompanying table:—

Variety	Number cut	Average price per doz.		Total Return	
		s.	d.	£	s. d.
Loos Tennis Ball	176 doz.	11	½	8	8 8
Cheshunt Early Giant	105½ doz.	2	3	11	17 4½
				£20 6 0½	

Conclusions. The trial has provided evidence that, under Northern conditions, Cheshunt Early Giant lettuce can be successfully grown as a winter crop under glass, and that under favourable circumstances, it will compare favourably with imported lettuce.

CULTIVATION OF WINTER LETTUCE

The essential factors for the successful cultivation of the crop are :—

- (i) Satisfactory control of *Botrytis*.
- (ii) The maintenance of a light, buoyant atmosphere.
- (iii) Ample ventilation.
- (iv) Plentiful water supply.

Thanks are due to Dr. Bewley for the valuable recommendations recorded by him from time to time as a result of earlier work carried out at Cheshunt, and upon which the general cultivation given to the crop in this trial was based.

DESTRUCTION OF POTATO HAULM TO PREVENT BLIGHT INFECTION OF THE TUBERS

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IN the June, 1935, issue of this JOURNAL (Vol. 42, No. 3, p. 231) Messrs. G. H. Bates and L. D. Martin gave an account of the results of a trial conducted in Norfolk, in 1934, on the destruction of potato haulm with sulphuric acid to prevent Blight infection of the tubers at the end of the season and at the time of lifting. Spraying with solutions of 10 and 20 per cent. sulphuric acid (Brown Oil of Vitriol) three weeks before the normal time of lifting killed the haulm effectively, and did not reduce the total yield. These solutions reduced the amount of "Blight" in the clamp from 9·4 cwt. per acre to 1·6 cwt. and 1·2 cwt. per acre respectively.

Copper sulphate solution has also been used in some parts of the country for killing potato haulm. For safety and convenience it has obvious advantages over sulphuric acid, and it is a potent fungicide. A trial in which the two materials were compared was conducted in 1935 by the writers, with the co-operation of Mr. C. W. Cave, who kindly provided facilities for the experiment on his farm at Terrington St. Clement.

There were three treatments:—

1. Sprayed with 100 gal. per acre 12½ per cent. solution (by volume) of Brown Oil of Vitriol. (Contract cost per acre 17s. 6d.)
2. Sprayed with 100 gal. per acre 5 per cent. solution (by weight) of copper sulphate. (Contract cost per acre 15s.)
3. Unsprayed (control).

The acid and the copper sulphate were applied with a horse-drawn spraying machine of standard type on Sept. 21, 1935, three weeks before lifting. Each plot was six rows wide and 140 yards long, the treatments being replicated four times in a randomized block arrangement. The produce from one of the two central rows of each plot was lifted and stored, separated from its neighbours in the clamp by layers of straw.

PREVENTION OF BLIGHT INFECTION OF POTATO TUBERS

When the crop was sprayed, the foliage was still green and little Blight was apparent, though on the unsprayed plots some Blight developed on the foliage before lifting occurred. Destruction of the haulm was more rapid and more complete with the acid than with the copper sulphate. With the latter, parts of the foliage were still green when the crop was lifted, whereas on the plots sprayed with acid the haulm was completely killed.

The clamp was opened on January 22, 1936. "Blights" and "lumps" (mis-shapen and cracked tubers) were set aside separately, as were other diseased tubers that did not show typical Blight lesions. These formed only a small proportion, and are grouped under "miscellaneous" in the table below. The remainder of the crop was riddled and graded into "ware," and "seed and chats."

The results were as follows:—

YIELD PER ACRE (TONS).

	Total Yield	Ware	Seed and Chats	Lumps	Miscellaneous	"Blights"	"Blights" as per cent. of total
Unsprayed ..	14.0	9.2	1.5	1.0	0.4	1.9	13.8
12½% Sulphuric Acid (B.O.V.)	14.8	11.0	1.7	1.0	0.4	0.7	4.7
5% Copper Sulphate ..	15.1	11.4	1.6	1.2	0.3	0.6	4.0
Standard Error	0.58	0.50	0.11	0.09	0.03	0.21	1.21

Spraying reduced the yield of "Blights" by about 1.2 tons per acre, copper sulphate proving to be as effective as sulphuric acid. As a result the yield of "ware" was greater where the crop had been sprayed, and this increase was significant. Spraying did not affect the total yield; from the unsprayed plots the total yield was apparently less than that from the plots which had been sprayed, but the difference was not significant.

It should be noted that spraying did not completely eliminate all Blight infection of the tubers. On the sprayed plots, between 4 and 5 per cent. of the crop was infected, whereas in the previous year the proportion of infected tubers in the sprayed plots was less than 1 per cent. of the total yield. The difference may be due to the greater incidence of Blight in 1935, and to infection of the tubers before spraying.

PREVENTION OF BLIGHT INFECTION OF POTATO TUBERS

In both trials the reduction in the amount of " Blights " was sufficient to pay for the cost of spraying. Bates and Martin showed that even with a reduction in " Blights " of 8 cwt. per acre (equal to about $6\frac{1}{2}$ cwt. of ware) spraying would normally be profitable. In the 1935 trial spraying reduced the " Blights " by 1.2 tons per acre (equal to about 18 cwt. of ware).

The operation could be cheapened slightly by substituting copper sulphate for sulphuric acid. On a contract basis, spraying with 5 per cent. copper sulphate solution would be about 2s. 6d. per acre cheaper, though this margin would be reduced, if not completely eliminated, if a stronger concentration than 5 per cent. should prove necessary to effect a more satisfactory destruction of the haulm. Copper sulphate spray, however, can be applied by an ordinary sprayer such as is likely to be found on potato farms; it does not require a special machine, the internal parts of which must be resistant to the corrosive action of sulphuric acid.

Dusting is another alternative. A special preparation containing finely-divided copper sulphate mixed with a " spreader " was obtained from a local firm of manufacturing chemists, and was applied with a blower, at the rate of 30 lb. per acre, when the haulm was wet after rain. Rain fell within 18 hours of application and the dust destroyed the haulm rather more effectively than the 5 per cent. copper sulphate solution.

In this preliminary investigation the proportion of " Blights " could not be recorded, but it is hoped to obtain such information this autumn. If a dust containing copper sulphate should prove to be as effective as the spray, then the opportunity of controlling late attacks of Blight and consequent tuber infection is offered to those areas where shortage of water precludes spraying. Further, an additional advantage of dusting is the comparative rapidity with which the work can be done.

THE HAWTHORN PLANT AND THE SELECTION OF "QUICK" FOR HEDGING

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THE Hawthorn or Quickthorn hedge is one of the most characteristic features of the English countryside, but has received very little notice from modern agricultural research workers. The hawthorn plant has proved so widely useful for hedging purposes and so highly resistant to ill-treatment, that little attention has been paid to its selection and improvement, a subject worthy of some investigation.

The hedge is produced from hawthorn plants or "quick" which have grown in the nursery for two or three years. A generation ago nurserymen produced the quick from "haws," the red fruit of the hawthorn, collected locally by women and children. These haws will not germinate during the first year after they are collected; they are stored in layers in damp sand for a year and are sown in the open in the following year. During the year's storage the pulp around the seed begins to rot and the embryo matures. Locally-gathered haws grow very slowly, and during the first year after sowing the shoot does not exceed 6 to 9 in. in length.

The slowness of growth from seed and the cheapness of one-year-old imported quick, which are bigger and stronger than those grown in this country, have considerably reduced the amount of quick grown at home from seed, and practically all the young plants used to-day, in this country, are of Italian, German or Dutch origin. The one-year-old imported quick are planted out in the nurseries, where they remain for one or two years, during which time they are once or twice transplanted. The quick are then sold according to size, with no distinction of variety or suitability for various soil or climatic conditions.

The Hawthorn Plant. The common Hawthorn is very variable in appearance. It was originally named *Crataegus oxyacantha* L., but this species was later sub-divided into

THE HAWTHORN PLANT



The Hawthorn Plant A. Less vigorous type of *Crataegus monogyna*. B More vigorous type of *C. monogyna* C Leaf of *Crataegus Oxyacanthoides*.

THE HAWTHORN PLANT

two sub-species, namely, *C. oxyacanthoides* Thuill, and *C. monogyna* Jacq.

According to Druce,* *C. oxyacanthoides* is found wild in this country in damper places than *C. monogyna* and is a lowland plant. The leaves have three to five rounded lobes, which are scarcely longer than they are broad (Fig. 1 C). The flowers have two or three stigmas and the fruit is two or three seeded. The sepals and flowerstalk are usually free from hairs. This species is less vigorous than *C. monogyna* and when allowed to grow naturally it reaches a height of 15 to 20 ft.

C. monogyna is native in Britain and grows over a wider range of altitude than the last species. It is found up to a height of about 1,800 ft. above sea level in Yorkshire. The leaves are three to five lobed, and the lobes are longer than broad, and pointed at the tip. The flower has a single stigma and produces one seed, and the sepals and peduncle are more or less downy.

According to Horwood and Gainsborough† (quoting the Transactions of the Leicester Lit. and Phil. Soc., 1881-82), "innumerable varieties have arisen from continued hybridization through several centuries between the two extreme forms," but in Leicester (incidentally a county famed for its thorn hedges) "the sub-species *C. oxyacanthoides* is more frequent in older hedges whilst *C. monogyna* and varieties approaching to that type, almost monopolize hedgerows planted during the last fifty years." In the East Midland province as a whole *C. oxyacanthoides* appears to be extremely uncommon, the common hawthorn of our hedgerows being practically all of the *C. monogyna* type.

Variability of *C. monogyna*. This species, of which most of our modern hedges are composed, is extremely variable. A very superficial examination of almost any thorn hedge when in leaf will confirm this. Much of the variation in this species cannot be accounted for by variation in soil and climatic conditions. Variation occurs in the colour of the bark of the one-year twigs, the size and shape of the leaves, the time of flowering, the size, shape and colour of the fruits, the colour changes which the leaves undergo in autumn, the

* Druce, G. C., *The Comital Flora of the British Isles* : Buncle, p. 112.

† Horwood, A. R., and Gainsborough, the 3rd Earl of, *The Flora of Leicester and Rutland*. Oxford Univ. Press, 1933.

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brittleness of the wood, the ability of the plant to grow when shaded, and the vigour with which renewed growth occurs after the hedge has been cut.

The last three points are of some practical importance. Firstly, when the wood is very brittle there is considerable danger of the layers snapping off when an old hedge is laid or plashed, and more care and time must be devoted to the laying of such a hedge. Secondly, in most hedges portions under trees are made up of dead fencing material because thorn does not usually flourish under the drip and shade of taller trees. Also, the filling of gaps in hedges, due to the death of some of the thorn plants, often presents some difficulty owing to the shading effect of the taller hedge plants on either side of any young quick inserted to fill the gap. A good variety that would grow well under such conditions would be of some value. Finally, it is highly desirable that the hedge should be vigorous and quick growing both from newly-planted quick, in order to produce a serviceable fence in as short a period as possible, and from the cut stools after laying or plashing, in order to produce a close bottom and form an effective barrier to stock. Choice of quick which will fulfil these conditions is essential if a really good hedge that will be serviceable over a long period of years is to be obtained.

Many of the distinctive varieties of the common hawthorn (*C. monogyna*) have been noted and named by various botanical observers, but, as far as the writer is aware, no information has been obtained with regard to the utility of the numerous varieties as hedging plants. Examination of hedgerows seems to indicate that in older hedges many types were planted indiscriminately, probably because the samples of quick were produced from a miscellaneous collection of seed obtained from several individual trees in the locality. There appears to be a little more uniformity of type in single samples of imported quick on the market to-day, but even in these some specimens differing widely from the general type are to be observed.

An attempt is being made to classify the common varieties with regard to their usefulness for fence production under various conditions. Preliminary observations have shown that the varieties may be divided into two main groups as follows:

(A) In this group the leaves of the long young shoots are

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small and very deeply lobed and often have leafy stipules at their base (Fig. 1a). The long twigs have spines at least above the lower leaves and often most of the leaves of the twig.

(B.) In this group the leaves are much larger and less deeply lobed (Fig. 1b), the size of the stipules varies considerably or they may be entirely absent. The one-year-old shoots are usually longer than those of Group A and relatively free from spines.

These differences can be detected in young quick obtained from the nurseries, and examples of each type are often present in a sample. Hedges composed of varieties in Group A are slower growing and less vigorous in every way than those produced from varieties in Group B. In young hedges where quick of both types occur, those of Group A are soon overtopped, and where few in number may be killed off by the more vigorous Group B type. It would therefore appear that, in selecting quick, samples having the characteristics described under Group B should be chosen for fence production, and samples containing a large proportion of Group A type should be rejected. Where only odd specimens of Group A type occur these should be discarded in order to avoid weak regions or gaps in the hedge owing to their absolute or relative failure. Preliminary observations show that each of the groups noted above may be subdivided into several distinct varieties, and it is hoped, by further study, to decide upon the varieties best suited for hedge production under particular soil and climatic conditions. Many miles of thorn fences are being planted, and will be planted in the future, along new roads, and it seems important in this connexion, as well as in relation to farm fences, that further knowledge should be available in order to facilitate ready recognition of samples suitable for the rapid production of good, living fences in various parts of the country. With this object in view observations are being made on growing hedges, and further information is being obtained from nurseries that supply quick, county surveyors' departments and others concerned with the planting of hedges, and from practical hedgers responsible for the subsequent upkeep of the living fence.

MARKETING NOTES

Milk Marketing Scheme. Sales during June, 1936. Pool prices and rates of producer-retailers' contributions for June, 1936, are given below, with comparative figures for May, 1936, and June, 1935. In each month the wholesale liquid milk price was 1s. per gal.

Region	Pool Prices			Producer-Retailers' Contributions		
	June 1936 d.	May 1936 d.	June 1935 d.	June 1936 d.	May 1936 d.	June 1935 d.
Northern	9	8½	9½	2½	2½	2½
North-Western ..	9	8½	9½	2½	2½	2½
Eastern	9½	9	10	2½	2½	1½
East Midland ..	9	8½	9½	2½	2½	2½
West Midland ..	8½	8½	9½	2½	3	2½
North Wales ..	8½	8½	9½	2½	3	2½
South Wales ..	9	8½	9½	2½	2½	2½
Southern	9½	9½	10	2½	2½	1½
Mid-Western ..	8½	8½	9½	2½	3	2½
Far-Western ..	8½	8½	9½	2½	3	2½
South-Eastern ..	9½	9½	10½	2½	2½	1½
Unweighted Average	9.05	8.8	9.57	2.59	2.78	2.14

These prices do not include any premiums for special services and level deliveries, or the accredited producers' premium of 1d. per gal.

The number of accredited producers was 16,879 and the sum required for the payment of the premium to them was equivalent to a levy of 0.332d. per gal.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, compared with 1¼d. per gal. in June, 1935. Sales on wholesale contracts were as follows:—

	June, 1936 (estimated) Gal.	June, 1935 Gal.
Liquid	46,672,156	46,002,486
Manufacturing	40,891,822	39,895,474
	<hr/> 87,563,978 <hr/>	<hr/> 85,897,960 <hr/>
Percentage liquid sales	53.30	53.55
Percentage manufacturing sales	46.70	46.45

The average realization price of manufacturing milk during June was 4.94d. per gal. compared with 5.19d. per gal. for June, 1935. The quantity of milk manufactured into cheese on farms was 2,700,394 gal. compared with 2,642,717 gal. in May, 1936, and 2,250,631 gal. in June, 1935.

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Amendment of Scheme: Poll on question of submission.

The result of the Poll on the question whether the proposed amendment of the Scheme should be submitted to the Minister was announced on July 14. The voting was as follows:—

In favour of submission :

38,130 producers (87.3 per cent.) having in their possession at noon on June 23, 1936 ..	716,106 cows (88.2 per cent.)
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Against submission :

5,523 producers (12.7 per cent.) having in their possession at noon on June 23, 1936 ..	95,544 cows (11.8 per cent.)
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The Agricultural Marketing Acts, provide that if, on a poll of registered producers on the question of the submission of amendment of an agricultural marketing scheme, those voting in favour of the submission of the amendment (a) number more than half the total number of registered producers voting, and (b) are capable of producing more than half the quantity of the regulated product that all the registered producers voting are capable of producing, then the amendment may be submitted. The result of the poll given above shows a substantial majority in favour of the submission of the amendment.

Pigs and Bacon Marketing Schemes. *Pig Prices for July, 1936.* The basic pig price (Class I Grade C) for July, 1936, was 11s. 4d. per score compared with 11s. for June. The increase in pig prices was due to a rise in the ascertained bacon price from 87s. 1d. to 89s. 7d. per cwt. The cost of the feeding stuffs ration, which has varied very little in the current year, was 7s. 9½d. per cwt., whilst the realization value of offals was 9s. 1d. as compared with 9s. 2d. in June.

Hops Marketing Scheme. The Permanent Joint Hops Committee have agreed to the payment from the Levy fund to the Hops Marketing Board of a sum of £19,206 16s. being the difference between the Board's total receipts in respect of sales of 1935 hops and the value of the estimated market demand at an average price of £9 per cwt. This is in accordance with the agreement made between the Hops Marketing Board and the Brewers' Society, and has enabled the Board to pay to producers a final 1 per cent. of the valuation of quota hops. A payment of 99 per cent. of the valuation had already been made.

ERRATUM

For “more than half” in lines 5 and 6 of paragraph 2, read “not less than two-thirds of.”

MARKETING NOTES

The Board have fixed October 6, 1936, as the latest date for tendering hops of the 1936 season. They have decided to make, through their agents, an advance of £5 per pocket to growers in respect of 1936 quota hops.

Committees of Investigation : Appointment of Chairman. The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed Mr. Harold L. Murphy, K.C., to be Chairman of the Committee of Investigation for Great Britain, appointed under Section 9 of the Agricultural Marketing Act, 1931, in succession to the late Mr. Edward Shortt, K.C.

The Minister of Agriculture has also appointed Mr. Murphy to be Chairman of the Committee of Investigation for England, the Chairmanship of which was rendered vacant by the recent death of Mr. James Whitehead, K.C.

Milk Acts, 1934 and 1936. Manufacturing Milk. Advances made by the Ministry up to July 15, 1936, in respect of manufacturing milk, were as follows:

Section.		Period of Manufacture	Gal.	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
	In respect of milk :			
1	Manufactured at factories other than the Board's	April, 1934, to April, 1936	377,863,558	2,028,686
2	Manufactured by the Board	April, 1934, to September, 1935	2,573,662	12,850
3	Made into cheese on farms	April 1934, to March, 1936	32,236,042	175,755
	Total for England and Wales		412,673,262	2,217,291
	<i>(b) Government of Northern Ireland.</i>			
	In respect of milk :			
6	Manufactured into cream and butter at registered creameries	April, 1934, to March, 1936	42,222,819	296,878

Milk-in-Schools Scheme. Exchequer contributions up to July 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 34,591,734 gal. of milk to school children at reduced rates during the months October, 1934, to March, 1936, amounted

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to £671,025. The following statement compares the gallonage consumed in the first six months of the first and second years of the scheme:—

	1st Year	2nd Year
	Gallons	Gallons
October	1,971,562	2,271,045
November	2,448,031	1,949,416
December	1,771,411	1,559,947
January	2,174,398	1,893,108
February	2,346,849	2,029,343*
March	2,388,041	2,046,867*
Totals for six months	13,100,292	11,749,726

* The figures for these months will be increased when further returns are received.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936, in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland, to be 4·97 pence per lb. for the month of July, 1936.

Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted by July 8, 1936, to £7,041,818. These payments were in respect of 2,968,141 animals, the average payment per beast being £2 7s. 5d. Some 890,000 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Cattle Industry (Marketing of Imported Cattle) Orders, 1934 and 1935.

Extension of Subsidy Period. Following the announcement made by the Minister in the course of his statement on Live-stock Policy on July 6 (see p. 425) the Cattle Industry (Emergency Provisions) 1936 Bill was introduced to extend without modification the existing subsidy arrangements until, if necessary, July 31, 1937. The Bill passed through both Houses of Parliament and received the Royal Assent on July 31, 1936. The expenditure involved by this extension for nine months is estimated at £3,000,000.

Wheat Act, 1932: Advance Payment to Registered Growers. The Wheat Commission have made an advance payment to registered growers at the rate of 2s. 9d. per cwt.

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(12s. 4½d. per qr.) in respect of 4,615,400 cwt. (1,025,600 qr.) of wheat vouched for by 26,389 wheat certificates delivered to the Commission between April 4 and June 26, 1936. The aggregate amount of the advance is approximately £634,600 payable to 19,900 registered growers.

No advance will be made during this cereal year on certificates delivered to the Commission after June 26. The next payment, which will probably be made about the middle of September next, will be the final payment for the cereal year ending July 31, 1936, to all registered growers who have delivered valid wheat certificates to the Commission during the cereal year.

Latest Date for Delivery of Wheat Certificates for 1935-36 Deficiency Payments. The Wheat Commission call attention to by-laws Nos. 27 and 30 governing the date by which wheat certificates must be delivered in order that a grower may receive deficiency payments thereon at the rate to be prescribed for the current cereal year. For practical purposes, if the sale of the wheat to which a certificate relates was *completed* by July 31, 1936, by actual delivery of the wheat before August 1, 1936, and if the certificate is valid in other respects, it can rank for payment at the 1935-36 rate though the certificate is not delivered to the Commission by July 31. It will assist the Commission, however, if certificates are sent in by July 31, and merchants and growers may save themselves inconvenience by adopting this course, as the Commission must satisfy themselves, in the case of certificates received after July 31, 1936, that the sale of wheat was in fact completed on or before that date, and the Commission may, for this purpose, require documentary proof of the sale.

Growers who do not sell their wheat before July 31, 1936, do not thereby lose all claim to a deficiency payment for that wheat. If the wheat is sold in the following cereal year it will rank for deficiency payment at the rate ultimately fixed for 1936-37.

Sales of Home-grown Wheat, Cereal Year 1935-36. Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to July 3, 1936, cover sales of 32,324,823 cwt. of millable wheat as compared with 34,435,038 cwt. in the corresponding period (to July 5) last year.

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Purchase of Stocks of Home-grown Wheat. The Wheat Commission have resolved that no representations be made to the Minister under Section 1 (3) of the Wheat Act, 1932, that it is expedient that any stocks of home-grown millable wheat be bought by the Flour Millers' Corporation during the cereal year 1935-36.

National Mark Beef. The number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during April, May and June, 1935 and 1936, and the three weeks ended July 18, 1936, were as follows:—

LONDON AREA

				<i>Home killed</i>	<i>Scotch sides for London</i>	<i>Total</i>
April	1935	..	..	11,334	8,391	19,725
"	1936	..	..	11,311	10,558	21,869
May	1935	..	..	11,980	8,153	20,133
"	1936	..	..	9,938	9,280	19,218
June	1935	..	..	9,720	7,064	16,784
"	1936	..	..	9,039	8,978	18,017
Three weeks ended	July 18,					
1936	..	..	..	5,243	4,941	10,184

BIRKENHEAD AREA

(including Liverpool)

				<i>For London (included under home-killed in London Area)</i>	<i>Liverpool (for local requirements)</i>	<i>Total</i>
April	1935	..	..	1,612	1,606	3,219
"	1936	..	..	1,405	1,678	3,083
May	1935	..	..	1,172	1,655	2,827
"	1936	..	..	1,054	1,469	2,523
June	1935	..	..	1,572	1,385	2,957
"	1936	..	..	909	1,462	2,371
Three weeks ended	July 18,					
1936	..	..	..	488	878	1,366

BIRMINGHAM AND YORKSHIRE AREAS

				<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
April	1935	..	..	5,216	2,697	1,890	540
"	1936	..	..	5,438	3,181	1,779	494
May	1935	..	..	4,995	2,532	1,628	428
"	1936	..	..	5,099	2,935	1,695	478
June	1935	..	..	4,119	2,309	1,381	388
"	1936	..	..	4,781	2,812	1,700	505
Three weeks ended	July 18, 1936	..					
		..		3,144	1,912	1,076	350

The number of sides graded and marked during April, May and June, 1936, shows an appreciable increase over the

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corresponding period in 1935, the figures being 94,610 sides, and 89,411 sides.

National Mark Schemes for Cheese. National Mark Wensleydale cheese is now on the market in good supply. National Mark Leicester cheese and Cream cheese are also obtainable. Developments are expected shortly which it is hoped will lead to Derby cheese taking its place as a National Mark product. National Mark standardization schemes are now in operation for all the leading varieties of cheese produced by the farm and creamery cheese-makers of this country.

Particulars of cheese packed under the National Mark during the period April 1 to June 30, 1936, are as follows:—

Type of Cheese	Number of packers whose cheese was graded	No. and weight of cheese graded	
		No.	Approx. Weight
			cwt.
Cheshire :			
Farm made 	189	29,133	14,566 (est.)
Creamery made 	14	34,386	13,352
Stilton :			
Blue 	9	2,213	288
White 		3,268	509
Caerphilly 	17	104,498	—
Cheddar 	5	1,606	739
Lancashire (scheme commenced May 6, 1936) 	14	6,053	2,207
Wensleydale (scheme commenced June 2, 1936) 	4	1,115	92

Experimental arrangements are being made with a view to the grading and marking of the exhibits of National Mark cheese packers at certain agricultural shows during the latter part of the present season.

Marketing Demonstration. Sale of Fat-stock from Farm to Abattoir. At the Three Counties, Royal and Great Yorkshire Agricultural Shows exhibits of live cattle, sheep and pigs were staged by the Ministry in order to illustrate the types of animals expected to kill out at the various carcass grades under the Grade and Dead Weight Scheme. The exhibits created considerable interest amongst stock farmers.

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Details of the weights and carcass grades of the four cattle exhibited at the Royal Show are as follows :—

Animals exhibited as	Live Weight			Carcasses in lb.	Kill out		Actual Carcass Grade
					Per cent.	lb. to live cwt.	
Super/Heifer ..	cwt.	qr.	lb.	693	61.6	69.0	Super
Grade I Bullock	10	0	4	682	59.4	66.5	I
Grade II do.	9	3	14	623	56.3	63.0	II
Grade III do.	10	0	3	613	54.6	61.3	III

New Zealand : Primary Products Marketing Act. A measure of considerable importance to the farmers of New Zealand was enacted in May of this year, its declared purpose being to ensure an adequate remuneration for the services rendered to the community by the producers of dairy produce and other primary products. The general intention is that, in order to protect producers from the effects of fluctuations in the market prices of their produce, the State should acquire, at prices to be fixed from time to time, the ownership of all such products intended for export and should, if thought desirable, similarly acquire or control the sale of products intended for home consumption. Machinery is provided under the Act to enable plans to be prepared for carrying out this general intention in respect of such commodities as may be selected from time to time; and detailed proposals are enacted for dealing forthwith with dairy produce, including certain products usually associated with dairy farming such as calves and pigs.

The Executive Commission of Agriculture established under the Agricultural (Emergency Powers) Act, 1934, is abolished, and its functions are to be taken over by a new State Department, to be known as the Primary Products Marketing Department. The Governor-General may appoint a member of the Executive Council to be Minister of Marketing and, responsible to him for the administration of the new Department, there will be a Director and Assistant Directors of Marketing. The Department will be charged with the general duty of marketing all products of which the Government has assumed control, and will assist in the preparation of plans in respect of other primary products. For the purpose of

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obtaining information necessary for the Department to fulfil its functions and for the Government to decide whether those functions should be extended or varied, the Director, acting with an Assistant Director or any other person appointed by the Minister, is empowered to act as a commission under the Commissions of Enquiry Act, 1908.

All expenditure incurred in the administration of the Act, including salaries and allowances of officers, sums due from the Crown in respect of dairy-produce, and the cost of freight, insurance, storage and marketing is to be met out of an account at the Reserve Bank known as the Dairy Industry Account, and all moneys derived from the sale of dairy-produce by the Department are to be paid into this Account. After the end of each completed year, the Minister must lay before Parliament statements of account together with a report on the operation of the Department for the preceding twelve months.

The provisions relating to dairy produce are operative as from August 1, 1936, in the case of factory-made butter and cheese. The former New Zealand Dairy Board is reconstituted as from this date. Thereafter the Board is to consist of five members, one of whom is to be appointed by the Governor-General in Council for a term of three years, the others being elected or appointed as provided in the 1934 legislation. The functions of the new Board are limited to conform with the reorganized marketing system and the Board may not exercise any of its powers or functions except with the approval (general or particular) of the Minister of Marketing. Other kinds of dairy produce may be brought under the operation of the Act at any time by notice published in the *Gazette*.

The Minister is vested with full authority to direct the handling, pooling, transport, storage, shipment and insurance of export produce. As soon as dairy produce intended for export has been accepted on board any ship for export from New Zealand (or earlier by Ministerial notice in the *Gazette*), it becomes the absolute property of the Crown, and the fixed price, less any levy that may be due to the Dairy Board, thereupon becomes payable to the producer. The prices to be paid by the Crown are to be fixed from time to time by the Governor-General by Order in Council, and different prices may be fixed in respect of different kinds, grades or qualities of dairy-produce. In fixing prices for the year ending July 31,

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1937, consideration must be given to the corresponding prices realized in a period of from eight to ten years immediately preceding July 31, 1935, but in fixing subsequent prices regard must be had to the prices fixed for 1936-37 and to a number of other considerations, including the general standard of living of producers relative to the general standard of living throughout New Zealand.

The Minister may determine that dairy produce intended for domestic consumption in New Zealand shall either pass into the ownership of the Crown, or pass under the marketing control of his Department, and in either case, prices may be fixed with the object of assuring the producer a net return equivalent to the return he would have received if his produce had been acquired for export. Resale prices may be fixed so that while distributors receive a fair remuneration for efficient services, the consumer shall not pay more than a reasonable price.

The validity of any Order fixing prices may not be questioned, and it is an offence to sell or offer to sell dairy-produce at other than the fixed prices.

The Minister of Marketing is empowered on behalf of the State to enter into negotiations with the accredited representatives of any Government (including those of the United Kingdom and any other part of His Majesty's Dominions) for the promotion of reciprocal trade, the basis of any such agreement being that the New Zealand Government will arrange through the Reserve Bank that the whole, or a substantial part, of the credits resulting in any country from the sale of New Zealand produce will be utilized for the purchase of goods produced in that country.

Union of South Africa : Agricultural Marketing Bill, 1936. After consideration by a Select Committee, the Agricultural Marketing Bill has been re-introduced into the Union Parliament. A number of changes have been made to meet criticisms of the original measure. The Bill, which provides "for the regulation of the production and sale of agricultural products" through the establishment of commodity marketing boards, has a close affinity to agricultural marketing legislation in this country and in certain other Dominions. It has, however, a number of interesting features of its own.

Considerable latitude is permitted in the constitution of

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boards to administer schemes; these may contain representatives of producers, processors and distributors, provided that the members representing producers exceed in numbers all those representing other interests. The Minister may nominate an officer of the Department of Agriculture and Forestry to be one of the members of the Board. Schemes may provide for administration being vested in any of the existing boards for livestock, dairy products, tobacco, wheat and mealies. Both regulatory and trading powers may be taken, and provision is made that the boards may advise the Minister in regard to the control and the regulation of import and export, of grades, and of other matters relating to production, development and marketing.

Schemes may be submitted to the Minister by any substantial body of producers and may in turn be submitted by him for examination to an Agricultural Investigation Board, consisting of four members appointed by the Governor-General. This Board may also, on instructions from the Minister, prepare schemes for the consideration of producers or examine the working of existing schemes and other matters.

Before a scheme can be approved, it must be submitted to two advisory bodies set up for the Minister's assistance—an Agricultural Advisory Council, representing producers, processors, distributors and the commodity marketing boards, and a Consumers' Council, consisting of the Chairman of the Agricultural Advisory Council and eight members representing consumers. A single advisory body may also be constituted from among the members of these two bodies for certain purposes.

Regulatory schemes may be brought into force by Order of the Governor-General, and if a poll is taken a 50 per cent. vote in favour is sufficient. Trading schemes require a 60 per cent. majority for approval and revocation, and in addition an affirmative motion in both Houses of Parliament.

It is understood that, in order to give the various interests an opportunity to consider these proposals in detail, the Government intend not to proceed with the Bill until the next session of Parliament.

Northern Ireland : Marketing of Eggs Act, 1936. A short note appeared on p. 277 of the June, 1936, issue of this JOURNAL describing the Marketing of Eggs Bill, which was

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introduced to complement the earlier egg marketing legislation of Northern Ireland and proposed, *inter alia*, the establishment of an Egg Marketing Committee, the creation of an Egg Marketing Fund, and the licensing of retailers. Wholesale dealers are already licensed under previous legislation.

This measure has since been enacted with certain amendments which, in the main, were concerned with the status of the Egg Marketing Committee. No change has been made in the composition of this Committee, which is to consist of a Chairman and two other members appointed by the Minister of Agriculture, five members representing egg producers and seven members elected by licensed wholesalers; the representatives of egg producers on the Committee are, however, to be appointed by the producers' organizations, and not, as had originally been proposed, by the Minister after consultation with such organizations. Under the Act as passed, the Ministry may refuse a new wholesaler's licence only if recommended to do so by the Committee and only if the holder has been convicted of an offence or has failed to pay sums due from him. The Ministry is also required to act in accordance with the Committee's advice in determining the prices at which and the terms on which eggs may be purchased by wholesale dealers. The Committee is to advise and assist the Ministry not only in regard to price determination, the licensing of wholesale dealers, and other marketing matters, but also in respect of production and the encouragement of research, education and publicity.

Licensed retailers are to pay a levy which must not exceed $\frac{1}{4}$ d. per dozen eggs; this levy is additional to the annual licence fee of 10s. Small retailers, however, who do not sell more than a prescribed quantity per week, are required to pay a composition fee which may not exceed £2.

France: National Wheat Office.—After a long debate, the Bill establishing a National Wheat Office was passed by the Chamber on July 4. The proposals of M. Monnet, the Minister of Agriculture, were accepted with small modifications. The effect of the Bill is to put the whole trade in grain and fertilizers into the hands of the State. A National Wheat Office is established and will receive a credit of one milliard of francs (£13.3 million) for the maintenance of the stock of grain and flour necessary for the supply of the cities and armed forces. The accumulation and storage of this stock will be effected by means of co-operative silos and an immediate credit of 100 million francs (£1.3 million) will be used to encourage silo construction.

The National Wheat Office will be an independent body, but its finances

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will be controlled by the Treasury. Its Board of Management will include representatives of the various official interests concerned, the producers, the Chambers of Agriculture, and the milling and baking industries.

During the second fortnight of June, this Board will estimate the yield of the national harvest and determine how much grain is to be delivered in advance of normal deliveries. The average cost price of wheat will be established during the first fortnight in August, and a national selling price for each grade of wheat will be decided during the second fortnight of August. Official prices will be fixed for the month of September, and to them will be added, for each subsequent month of the cereal year, a storage fee of 50 centimes per quintal.

The National Wheat Office will also fix the price of flour and bread, and will devote particular attention to reducing the margin between wheat prices and bread prices. Only approved co-operative societies will be allowed to buy wheat from the producers, and many new societies will have to be established for this purpose. These societies, in conjunction with the Agricultural Credit Fund, and with the support of the Bank of France, will be empowered to grant credit facilities to farmers. Their costs will be met from a fund contributed by all farmers, except those with the smallest holdings, in the form of a levy on all wheat sold by them.

A Grain Testing Office will be set up in each Department to determine the variety, specific weight, purity and humidity of locally-grown wheat, and to settle any differences of opinion that may arise between producers and purchasers.

In the first fortnight of September, each farmer must report the amount of his harvest to the local authorities. If threshing is not complete, a provisional declaration can be made, and this can be corrected later. During the second fortnight of September, the Board of the National Wheat Office will consider the results of the harvest and decide on the quantity of grain to be imported, in order to meet normal requirements, for the ensuing twelve months. If there is a harvest surplus, the Board will decide how much grain is to be exported or stored. These quantities may be varied from time to time as more accurate information becomes available.

The National Wheat Office will have a monopoly of the import and export of grain and bread cereals. The Board will decide on purchases, quantities to be bought, prices and conditions, dates of delivery and of payments. Bearing in mind the seasonal variability of requirements, the Board will endeavour to spread their transactions over the whole year, so as to stabilize prices. They will also fix the selling price of imported grain.

A grain silo will be established on a co-operative basis in each agricultural region, and will be managed by representatives of the farmers. Each silo co-operative will be bound to accept all the grain offered to it, at the prices fixed by the National Wheat Office. The whole body of silo co-operatives will be brought together in a federation of agricultural co-operatives, which will be managed by a Board, elected by the Managing Boards of the local silos, voting together, the Chairman being nominated by the National Wheat Office. This federation will, in conjunction with the National Wheat Office, co-ordinate the purchases and sales made by the co-operatives, in response to local conditions.

The new system goes beyond all previous attempts at State control in France. The corn merchants, as individual traders, will no longer be in direct contact with the growers, and will only be able to act as intermediaries between the co-operative silo societies and the millers. It is possible that the Wheat Exchange, where quotations have recently been quite nominal, may cease to exist. (*Note by the Market Supply Committee.*)

AUGUST ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

BEFORE the importation of foods began and farm crops became so diversified, August was of even greater importance in the farm calendar than it is nowadays; relics of this time, when it was a case of "all hands on deck" during this month, are to be found in University and school holidays, and in the various festivals that followed harvesting. Except on grass farms, August still has the claim to be the busiest month owing to the large proportion of cereals in the arable acreage. In a survey of 12 farms in the Eastern Counties, carried out in 1927 and 1928 (Kirkpatrick: *Seasonal Distribution of Farm Labour Requirements*), the greatest number of man-hours worked per fortnight occurred in the 14 days ending September 2, when the relative number of hours was 117, as compared with the lowest of 84 in January. The greatest application of horse labour was effected in the same period, i.e., the fortnight ending September 2, when the relative number of horse hours reached 136, against the lowest of 74 worked during the two weeks ending January 7.

Fat Stock. "August Bank Holiday week is never good for the meat trade, and when combined with a heat wave it is disastrous." This sentence occurred in one of the weekly circulars sent out by the wholesalers last year, and illustrates the sort of disappointment that a grazier is likely to encounter in this most important marketing month. In spells of hot weather the prices of the heavier animals are affected much more than those of the smaller weights. In the same circular it was stated that, while small lambs were difficult to get, the heavier lambs would have been unsaleable "but for some shipping and hotel orders." Although refrigeration is general in meat shops, and is now reaching middle-class homes, it will be a long time before the prices of fat stock will be unaffected by hot weather.

A good finish is always important, but never more so than when the markets are flooded with grass beef. At this time of year the concentrates for supplementing grass should have more protein than when used in May and June. Maize, in

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some form or other, is an important constituent of most mixtures, and the protein content can be raised by cotton cake, earth-nut cake, etc. A keen Herefordshire feeder mentioned a few days ago that there is much to be said for taking cattle off grass for the last three or four weeks before selling and feeding indoors on good hay and concentrates. This makes them firmer and appear better finished. A heifer treated in this way realized the top price in Hereford market late in June.

Sheep. Maggot-fly and foot-rot are pests that make it necessary to give attention to the flock at this time of year. The fleece of the ewes has by now grown sufficiently to hold dirt and moisture, so that both ewes and lambs require dipping for protection. Foot-rot is difficult to eradicate. If ewes have to be purchased annually, it is almost impossible to keep a farm free from this. If a farm is free, however, it is well worth while attempting this by walking all purchased sheep several times through a 7 per cent. solution of copper sulphate. The treatment of affected sheep at this time of the year is a familiar sight; drastic paring of the feet, with the rubbing in of Stockholm tar, blue-stone ointment or proprietary preparations, is the accepted method. The flock may be penned, and a half-day given to this work, or the shepherd may, instead, carry about with him the requisite material and treat an affected sheep as opportunity presents itself. A non-contagious condition, better described as "foot-sore" is sometimes mistaken for foot-rot. (Ministry of Agriculture Advisory Leaflet No. 95). Though this condition does not spread through the flock, several sheep may be affected simultaneously. It is caused by injury to the foot and may be brought about, for example, by continual grazing of the sheep on marshy pastures.

Tupping for January lambs is carried out this month. The ewes are examined beforehand, and those not right in teeth and udders removed. Some udder defects are difficult to notice at this period, and it is sound practice to mark all ewes having defective udders as they are detected, after lambing. On some farms the ewes are retained in the flock so long as they are sound in mouth and udder. Ewes that have bred for six and seven seasons are common. The age at which teeth are lost varies greatly with the nature of the food. On hard hill pasture, for instance, they are retained better than

AUGUST ON THE FARM

on lowland grass. An instance was recorded of a season of two Herdwick ewes in a flock, one of which dropped a lamb at 32 years of age and the other at 30. Rams are preferred in the lamb stage, particularly in grass flocks; in many of these it is customary to buy ram lambs each year. There is no evidence to show that better lambs result from the use of young rams. If sheep-recording is ever practised, enabling good rams to be singled out by a progeny test, rams will be kept to a much greater age than at present. Sheep-recording, used in conjunction with artificial insemination, holds out great possibilities for the sheep industry in the future.

Dairy Cows. With milk becoming less plentiful, the price of cows hardens this month, and does not give way until early January. The reduction in milk yield is brought about by a slowing down in the growth of grass and by a decrease in the quality of the herbage, which gets stemmy rather than leafy. Hot weather also reduces milk yield where the fields are badly provided with shelter. A Midland producer, with over 100 cows, who practises three-times-a-day milking, retains the cows in the sheds from the mid-day milking till next morning; one reason for this is that he believes that, if the cows are adequately fed, they will produce more milk indoors on a hot afternoon, than in the open field. Doubtless a good deal will depend on the air-space and ventilation of the byres.

In the north and west of Britain, considerable loss to owners of dairy herds is caused at this time of year by "garget" or mastitis, an affliction of the udder. The attack may be slight, causing a few days' trouble to one or two cows, or it may be so severe as to cause death. In one instance, 4 cows died within a week in a herd of 40 cows in milk. Dr. Mattick, in February of this year estimated the loss in milk yield due to mastitis to be 94 gal. per cow per annum, and that 13-14 per cent. of cows in milk are affected. Dr. S. J. Edwards (*Scot. Jour. of Agric.*, Jan., 1936) notes that there may be two forms of mastitis, the "chronic" and "summer." In the chronic form, or "weed," the disease lasts long, but the symptoms are mild. For a long time there may be no clinical sign of the disease in the udder or milk, but the cow may be a carrier. First calvers are free, but 30 per cent. of cows are affected with this disease, the first sign of which may be a small clot in the fore milk. In summer mastitis or garget,

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the greatest loss takes place in cows on pasture in summer. The affected quarter becomes swollen, painful and hard, and the cow is obviously unwell if the attack is bad. The milk from the affected quarter is clotted, and may be foul smelling. Flies are said to be responsible for spreading this type of infection, which occurs mostly when the cows are dry. Some dairy farmers, by continuing to milk the cows, try to avoid the dry period in summer in order to minimise the risk of garget. A definitely more helpful method of prevention has been tried lately, and consists of sealing the teat canals with thick oil impregnated with a germicide. Flies infect the end of the teat but this treatment prevents the infection passing up the teat duct to the udder tissue.

Professor Minett (*Farmer's Guide to Agricultural Research* in 1934) quotes interesting results from Denmark that indicate the part played by teat scars in causing mastitis. In a herd of 147 cows, the proportion of cows with scars near the teat orifices was considerably higher in cows with mastitis. In experiments made later, a small clean wound was made near the opening of the teat canal, and the animal milked with infected hands. With the first three animals, infection was produced in 5 out of the 6 quarters of which the teats had been injured, while none of the other quarters was affected. It was concluded that an important method of prevention was, therefore, to construct suitable byres, particularly as regards floors.

Harvest. Except in bad weather, the corn harvest is a time of hard work and good cheer, with good-natured jokes that, although heard every year, never seem to lose their point. The attempts of those in the field to overwhelm those in the stackyard with frequent and heavy loads, and the messages from the stack to the field that the men are "dying of cold" all seem part of a good English harvest. In some parts, as in Shropshire, penalties of a pint of beer for "grounding" the fork, or for pitching over the back of the waggon, used to help to restrain the ardour of the pitcher and to protect the builder in his important work.

Threshing off the field, though by no means new even in this country, has been much debated in recent years. It has the advantage that stacking and perhaps thatching are avoided, and a quick return is given. On heavy land, far from roads, the crop must needs be threshed by the time the

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wheat is sown, or threshing will have to be left until spring. On the higher land in the south of Wiltshire, for example, the crop dries well in the stooks, there being very few woods and hedges to break the sweep of the wind; in a favourable season the grain may be sufficiently dry for threshing from the stook and storing without artificial drying.

The introduction of grain-driers has increased the interest in this question, since the crop may be threshed directly off the field in all seasons if the grain is subsequently dried. In the average harvest, grain contains 20-25 per cent. of moisture directly after cutting; for sale, or storage in bulk, the proportion of water should be about 14 per cent. In a dry season like 1935, most of the grain had as little as 16 per cent. water at reaping time, and, after a period in the stooks, would be near 14. Although the use of the combine-harvester focused attention on grain-drying, many experienced corn growers who do not use these, have installed grain-driers. The grain-drier is used, not only to enable some of the crop to be threshed off the field, but for drying the grain after a bad harvest, or corn that has got wet in the stack. A barley grower between Newmarket and Royston is said to have paid off half the cost of his drier in one season by taking grain to dry at 2s. 6d. per quarter.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended July 8				
	Bristol	Hull	L'pool	London	Cost per Unit †
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
„ „ Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia :					
Neutral (N. 20·6%) ..	7 5d	7 5d	7 5d	7 5d	7 0
Calcium Cyanamide (N. 20·6%)	7 5s	7 5s	7 5s	7 5s	7 0
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	4 18	4 15	4 13	4 15	3 2
„ „ (Pot. 20%) ..	3 15	3 12	3 10	3 12	3 7
Muriate of Potash (Pot. 50%) ..	7 18	7 16	7 12	7 16	3 1
Sulphate „ „ (Pot. 48%) ..	9 8	9 6	9 2	9 6	3 10
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
„ „ (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26—27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
„ „ (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½%, P.A. 20½%) ..	..	6 17	6 5h	6 0	..
Steamed Bone Flour (N. ½%, P.A. 27½—29½%) ..	5 12	5 10	5 0h	5 2	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ;
S.P.A. = Soluble Phosphoric Acid ; Pot = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool f.o.r. neighbouring works, and at London f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

† These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22½ lb.) so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures" obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Quality in Animal Produce. No claim to superiority is more persistently maintained by the British farmer than that of the superior quality of the home-grown food product, whether vegetable, meat or dairy product, as compared with the imported article. That such superiority exists in our best produce can hardly be doubted and is rightly made much of as an asset in the development of improved marketing organization.

The increasing stress upon the importance of securing the highest level of quality in British produce, which has been noticeable in recent years, is reflected in the working of the new marketing schemes, some of which embody as a central feature provisions for quality grades and payment by quality. This is notably the case in the bacon scheme, and must almost certainly figure in any other meat marketing schemes, and eventually perhaps to a greater extent also in the milk marketing scheme.

In seeking guidance as to the factors that determine "quality" in animal produce, and especially meat products, and as to the most efficient methods of directing the operation of these factors towards the desired end, great difficulties arise owing to the impossibility of defining "quality" in precise terms.

As regards meat, apart from the quantities of fat and lean and their distribution in the different parts of the carcass, none of the various criteria that together constitute quality, such as colour, aroma, texture of lean and fat, cooking quality, is capable of exact measurement. The criteria can only be assessed by methods which, though perhaps adequate to differentiate good quality from bad quality, are unreliable for the more common case where intermediate grades of quality require to be classified.

It is not surprising, therefore, that such information as is already available shows many contradictions on points of detail, and it is certainly far from adequate for the formulation of a complete "quality technique" for the guidance of the farmer. Certain broad generalizations are, however, sufficiently well supported by evidence to merit acceptance.

The most fundamental of these, perhaps, is that which lays

NOTES ON FEEDING

down that certain quality factors are inherited, and their working can only be influenced within relatively narrow limits by changes in the environment, management or feeding of the animal. The ideal meat-making animal is born such, as also is the cow that consistently gives milk rich in fat. Judicious selection and mating of breeding stock must thus form the basis of any "quality policy." The animal that is bred for high quality will not necessarily respond, however, unless given full opportunities through correct management and feeding, although it will hardly sink to the lowest level of quality even under bad conditions.

In management of the meat-producing animal the aim should be to secure uninterrupted development of the young animal, though not necessarily at the highest rate of live-weight increase of which it is capable, since this may result in too high a proportion of fat to lean. This will be influenced to some extent by the class of animal, the degree of restriction of its freedom of movement, the amount and character of the food supply, and possibly by other factors of which as yet we know but little. Whatever these conditions may be, however, it is a matter of common experience that the animal whose development has been hampered by illness, or other abnormal cause, will rarely in the end give a product of high quality.

Food Oil and Animal Fat. The effects of food upon meat quality are to be noted both in the lean and the fat, but are more readily traceable in the latter. This applies particularly to the influence of the fats or oils of the food upon the characteristics of the meat fat, or the fat of products such as milk or eggs.

Oils and fats, both of plant and animal origin, are similar in chemical structure, being combinations of glycerine with various organic acids, of which by far the most common and abundant are palmitic, stearic and oleic acids. It is not surprising, therefore, to find that the nature of the food-oil has a potent influence upon the quality of the animal fat. Broadly speaking, we may say that the food-oil tends to impress its own character upon the body-fat (or milk-fat). The changes in the chemical composition of the body-fat that are caused by even very oily foods are as a rule relatively small, but they may nevertheless be of great economic importance, since "quality" in the fat is determined primarily by

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its degree of softness or greasiness, which may be greatly affected by small changes in the fat.

The firmness or softness of fats (and the hardening or softening effects of oils) is largely determined by the proportion of acids of the oleic acid type ("unsaturated acids") present in them. The greater the proportion of unsaturated acids present, the softer is the fat likely to be; or if it be a food-fat, the greater will be its tendency to soften the body-fat (or milk-fat) of the animal. This has been strikingly illustrated in experiments at Cambridge with fowls, which seem to be even more susceptible than the larger animals to these fat effects.

If the diet is practically free from fat, the body-fat will be made chiefly from carbohydrates, and to some extent from proteins, of the food. Fat made in this way is usually of a firm, hard type. Introduction of oily food into such a diet will usually lead to the deposition of a softer type of fat in the body, the effect varying with the nature and amount of the oil fed. Thus the oils of cottonseed, palm kernel and coconut have only a relatively small softening effect on beef and mutton fats, and actually tend to harden milk- and pork-fats; whilst the oils of maize and rice have a marked softening tendency on all animal fats.

From what has been said, it follows that by the judicious selection of oily foods, much can be done to ensure any desired degree of firmness in the fat of the meat. Thus, where experience shows a tendency to production of unduly hard fat from a particular ration, as so often happens in beef and mutton production, the inclusion of a food containing a softening oil, such as maize or rice meal, should be advantageous. In the production of pork and bacon, on the other hand, since the feeder's problem generally is to get the fat firm enough, he will usually be well advised to keep the supply of softening oils in the food down to a minimum. He will prefer barley and wheat to maize and oats, degermed maize to ordinary maize meal, extracted oil meals to oil-cakes, and so on.

Similar considerations apply in the case of the butter-maker, for whose purpose softening effects are desirable in winter and undesirable in summer.

So far, we have referred to the body-fat as if it were all the same, but such is not the case. There is a relatively small amount of fat closely associated with the tissues and vital organs of the body, and this is but little affected in nature by

NOTES ON FEEDING

changes of diet. The rest, and by far the greater part, of the fat represents reserve material stored partly below the skin, especially on the back, and partly round some of the internal organs ("leaf"-fat). The back fat consists of at least two distinct layers, of which the outer is usually rather softer than the inner layer, and this in turn softer than the "leaf"-fat. These differences are probably associated with differences in the temperature of the different parts of the body in which the fat is deposited, this temperature naturally being highest in the interior of the body and lowest in the region just below the skin.

The influence of food-oil on the body-fat is shown chiefly in the "leaf"-fat and in the lower layers of the back-fat, the outer layer of back-fat being much less affected by variations of diet.

This relative constancy in composition of the outer back-fat may perhaps be due to adjustment of the nature of the fat nearest the skin to a more or less constant consistency adapted to the average conditions of the atmosphere. Fat in the cells of the living body must be kept in fluid form, so that if the surface of the body is exposed to cold, one might expect that a fat of more oily type (i.e., more resistant to freezing) would be deposited in the tissue under the skin, than under warmer conditions. In other words, warm conditions should tend to give firmer, and cold conditions softer, fat, in this outermost layer of the back-fat. This view lends support to the advocacy of warm housing for the pig in winter. It also raises the interesting speculation as to whether the back-fat of a black-skinned animal may not tend to be softer than that of a white-skinned animal exposed to the same conditions, since a dark surface will generally radiate heat more rapidly than a light surface and consequently respond more quickly to changes of external temperature.

Along with softness, the colour of the carcass-fat is also of importance as a quality factor. In the fresh carcass, this is normally white to yellowish white, and on keeping tends to turn a deeper yellow owing to oxidation, especially in the case of the softer types of fat when exposed to light. These changes are associated with the development of rancidity and may set in quite suddenly or more slowly. As regards pig fat, there is evidence that codliver oil in the diet apparently speeds up the process; if so, this must be offset as a disadvantage against its value as a source of the A and D vitamins.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat British ...	6 13	0 8	6 5	72	1 9	0·94	9·6
Barley, British feeding	5 10	0 8	5 2	71	1 5	0·76	6·2
" Canadian, No. 3							
Western ...	5 15	0 8	5 7	71	1 6	0·80	6·2
" Canadian, No. 4							
Western ...	5 7†	0 8	4 19	71	1 5	0·76	6·2
" Canadian, No. 5							
Western ...	5 3†	0 8	4 15	71	1 4	0·71	6·2
" Argentine ...	5 10§	0 8	5 2	71	1 5	0·76	6·2
" Persian ...	5 3*	0 8	4 15	71	1 4	0·71	6·2
" Polish ...	5 15	0 8	5 7	71	1 6	0·80	6·2
" Russian ...	5 13	0 8	5 5	71	1 6	0·80	6·2
Oats, English, white ...	6 7	0 9	5 18	60	2 0	1·07	7·6
" " black and grey							
Scotch, white ...	6 7	0 9	5 18	60	2 0	1·07	7·6
" Canadian, No. 2							
Western ...	6 13	0 9	6 4	60	2 1	1·12	7·6
" Canadian mixed feed ...	7 2*	0 9	6 13	60	2 3	1·21	7·6
Maize, Argentine ...	5 2	0 9	4 13	60	1 7	0·85	7·6
" Danubian Gal. Fox	5 0	0 7	4 13	78	1 2	0·62	7·6
" South African	4 13†	0 7	4 6	78	1 1	0·58	7·6
No. 2 White Flat							
Peas, Japanese ...	5 0†	0 7	4 13	78	1 2	0·62	7·6
Peas, Japanese ...	16 12†	0 15	15 17	69	4 7	2·46	18·1
Dari ...	7 5†	0 8	6 17	74	1 10	0·98	7·2
Milling Offals :							
Bran, British ...	5 5	0 15	4 10	43	2 1	1·12	9·9
" broad ...	5 12	0 15	4 17	43	2 3	1·21	10·0
Middlings, fine, im- ported ...	5 16	0 13	5 3	69	1 6	0·80	12·1
Weatings† ...	6 2	0 14	5 8	56	1 11	1·03	10·7
" Superfine† ...	6 15	0 13	6 2	69	1 9	0·94	12·1
Pollards, imported ...	5 5	0 14	4 11	50	1 10	0·98	11·0
Meal, barley ...	6 17	0 8	6 9	71	1 10	0·98	6·2
" " grade II ...	6 2	0 8	5 14	71	1 7	0·85	6·2
" maize ...	5 10	0 7	5 3	78	1 4	0·71	7·6
" (South Afri- can) ...	5 0§	0 7	4 13	78	1 2	0·62	7·6
" " germ ...	5 10	0 11	4 19	84	1 2	0·62	10·3
" locust bean ...	7 15	0 5	7 10	71	2 1	1·12	3·6
" bean ...	8 5	0 17	7 8	66	2 3	1·21	19·7
" fish (white) ...	13 10	2 2	11 8	59	3 10	2·05	53·0
Maize, cooked, flaked ...	5 17	0 7	5 10	84	1 4	0·71	9·2
" gluten feed ...	5 10	0 13	4 17	76	1 3	0·67	19·2
Linseed cake :							
English, 12% oil ...	8 10	1 0	7 10	74	2 0	1·07	24·6
" 9% " ...	8 0	1 0	7 0	74	1 11	1·03	24·6
" 8% " ...	7 15	1 0	6 15	74	1 10	0·98	24·6
" 6% " ...	8 2§	1 0	7 2	74	1 11	1·03	24·6

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Soya-bean cake, 5½% oil	£ s. 8 15	£ s. 1 8	£ s. 7 7	69	s. d. 2 2	d. 1' 16	% 36'9
Cottonseed cake, English, Egyptian seed, 4½% oil ...	4 17	0 18	3 19	42	1 11	1' 03	17'3
Cottonseed cake, Egyptian, 4½% oil ...	4 12	0 18	3 14	42	1 9	0' 94	17'3
Cottonseed cake, decorticated, 7% oil	7 0†	1 8	5 12	68	1 8	0' 89	34'7
Cottonseed meal, decorticated, 7% oil	7 0†	1 8	5 12	70	1 7	0' 85	36'8
Coconut cake, 6% oil ...	6 5	0 18	5 7	77	1 5	0' 76	16'4
Ground nut cake, 6-7% oil	6 0*	0 18	5 2	57	1 9	0' 94	27'3
Ground nut cake, decorti- cated, 6-7% oil ...	7 17	1 8	6 9	73	1 9	0' 94	41'3
Ground nut cake, im- ported decorticated, 6-7% oil	7 2	1 8	5 14	73	1 7	0' 85	41'3
Palm-kernel cake, 4½-5½% oil	6 5†	0 12	5 13	73	1 7	0' 85	16'9
Palm-kernel cake meal, 4½% oil	6 2†	0 12	5 10	73	1 6	0' 80	16'9
Palm-kernel meal, 1-2% oil	5 10	0 12	4 18	71	1 5	0' 76	16'5
Feeding treacle	4 12	0 8	4 4	51	1 8	0' 89	2'7
Brewers grains, dried ale	4 10	0 11	3 19	48	1 8	0' 89	12'5
Brewers grains, dried porter	4 2	0 11	3 11	48	1 6	0' 80	12'5
Dried sugar-beet pulp (a)	5 15	0 5	5 10	66	1 8	0' 89	5'2

(a) Carriage paid in 5 ton lots.

* At Bristol.

§ At Hull.

† At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provincial.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated and refer to the price ex-mill or store. The prices were current at the end of June, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus if linseed cake is offered locally at £9 per ton, then since its manurial value is £1 per ton, as shown above, the cost of food value per ton is £8. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22'4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1'16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices: N., 7s. 3d.; P₂O₅, 2s. 3d.; K₂O, 3s. 5d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	5 9
Maize	78	7·6	5 0
Decorticated ground-nut cake	73	41·3	7 9
„ cotton-seed cake	68	34·7	7 0
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1·40 shillings, and per unit protein equivalent, 1·47 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9·6	5 15
Oats	60	7·6	4 15
Barley	71	6·2	5 9
Potatoes	18	0·8	1 6
Swedes	7	0·7	0 11
Mangolds	7	0·4	0 10
Beans	66	19·7	6 1
Good meadow hay	37	4·6	2 19
Good oat straw	20	0·9	1 9
Good clover hay	38	7·0	3 3
Vetch and oat silage	13	1·6	1 1
Barley straw	23	0·7	1 13
Wheat straw	13	0·1	0 18
Bean straw	23	1·7	1 15

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

The Welsh Goat

THE following note by Mr. John A. Caseby, Hon. Secretary of the Welsh Goat Breeders' Association, has been reproduced, with slight amendments, by courtesy of the British Goat Society:—

In the days when Llewellyn hunted with his faithful hound Gelert, the wild goats of Wales roamed the mountains of Snowdonia, the Plynlimmon and Cader Idris ranges, and even as far south as the Prescelly Hills in Pembrokeshire and the Black Mountains of Brecon.

Many people have tried to approach the few wild goats remaining in the Welsh fastnesses, but without success. A good deal of publicity has been given recently, however, to an incident in which a wild she-goat and her kid were observed on a rocky ledge high on the mountain side in the wilds of Merionethshire, between Dolgelley and Abergynolwyn. Rescuers attempted to save them, but the old goat jumped from the ledge and was killed, while the kid was secured and brought to safety. Members of the Welsh Goat Breeders' Association have reported the presence of a few wild goats, grazing on distant moorlands at the foot of the hills, and have described them as small, grey-brown in colour, long-haired and horned. The males are larger than the nannies, having long horns curving outwards.

This description of the wild goats of Wales resembles so closely that of the goats kept in remote parts of the Principality that it might be reasonably assumed, either that the domestic goats tethered on a plot behind the cottage had as ancestors the wild goats of the district, or that the wild goats now inhabiting the Welsh mountains were really domestic animals that had escaped from captivity. A member of the Association recently reported that a wild billy had visited his pedigree nannies and that they had been mated—rather a catastrophe if the breeder had visions of winning at the Royal Welsh, or some other Show! May not this be regarded as one of Nature's methods of maintaining the stamina of the species? The result of such a cross would not be a gallon milker, but it would not be a goat that required made-to-measure rugs or coats in winter.

However, as a result of the policy of improvement encouraged by the Welsh Goat Breeders' Association, the Welsh goat, as we know it, is rapidly becoming extinct. For 8 or 9 years now, pedigree males of various breed types have

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been placed at stud, and, to those who measure improvement in quarts and gallons, the results are very gratifying. To see three or four generations in one herd, and to note the definite change in type and size, is a remarkable object lesson in live-stock improvement. The original Welsh goat, short in the legs, small in the body, with long hair and long horns, is mated to a British Alpine buck, large, short-coated and hornless. The first generation is a British Alpine type, horned and with fairly long hair, particularly on the flanks and hind legs. The third generation, sired by a pedigree buck, shows better size and type, much greater milk yield and shorter hair. Some of the kids may be hornless. The hardiness of the Welsh goat appears to be retained in succeeding generations, but this may be because the progeny are indigenous to the district and can endure the vagaries of the climate.

Although the average milk production of the pure Welsh goat is low, the butter-fat percentage is high—certainly higher than the average for the recognized breeds, except the Anglo-Nubian. One might argue, of course, that it is easy to obtain a high butter-fat percentage when the yield is low.

The long hair of the Welsh goat renders milking difficult; when the hairs are accidentally pulled the goats become nervous and restive. Long hair also increases the difficulty of keeping the body free from lice. These troubles may be avoided, however, by shearing the animals in spring, and, if necessary, again in early autumn; but, unless actually advised to do so, few Welsh goat owners undertake this operation.

The sole remaining herd of Welsh goats belongs to Mr. R. Vaughan, D.L., J.P., Garthmaelan, Dolgelley, who has been chairman of the Welsh Goat Breeders' Association since its formation in 1928. He has about 18 Welsh goats that live a free range life on his estate facing Cader Idris; some of them are over 16 years old and still producing kids and milk.

Although the Association has doubled the average milk yield by its policy of using high class sires from the best strains of milch goats, some may consider that it would have been preferable to have attempted to improve the native breed. This was not found to be practicable, however, owing to the difficulty of securing good type males from reasonably good producers. Moreover, there is little demand for horned goats, especially horned males. The Welsh goat must be regarded as moribund, but the Welsh improved breed is increasing



A Typical Welsh Goat.



Photos : Courtesy of British Goat Society.

Another Specimen of the Welsh Breed.

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rapidly and is destined to play an important part in the economic life of the Principality.

The Agricultural Index Number

THE June index of prices of agricultural produce at 116 (corresponding month of 1911-13=100) is 1 point higher than that recorded in May and 5 points above the corresponding figure of a year ago. If allowance be made for payment⁴ under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the month under review becomes 121. The principal price increases applied to fat cattle, fat pigs and eggs, while values for barley, fat sheep, butter and potatoes showed a reverse movement.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	—
August	121	105	105	119	113	—
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Grain. At an average of 6s. 8d. per cwt., wheat declined by 1d., this fall being insufficient to affect the index figure, which remains at 84. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration, the index rises to 117.) Values for barley were reduced from 8s. 1d. per cwt. in May to 6s. 10d. in June, the index depreciating by 13 points to 92. Oats, at 6s. 2d. per cwt., were 1d. higher than a month earlier; this increase, however, was counter-balanced by a similar movement during the base period, and the index is unaltered at 82. In June, 1935, wheat averaged 5s. 6d., barley 7s. and oats 7s. 4d. per cwt., the relative indices being 69, 94 and 98.

Live Stock. Prices for fat cattle continued to advance during the earlier part of June, but a decline was noticeable towards the close of the month. The average for second quality fat cattle, however, at 36s. 5d. per live cwt. was

MISCELLANEOUS NOTES

is. 8d. higher than a month ago. Although the price rose during the corresponding months of the base period, the increase was 3d. per live cwt. only, and in consequence the latest index figure appreciates by 4 points to 98. The addition of the subsidy payment of 5s. per live cwt. would cause the index to rise to 111. The seasonal fall in values for fat sheep continued, and second quality at 9½d. per lb. were ¼d. lower on the month; as a similar fall occurred during the base period, the index at 131 was little altered. Bacon pigs and porkers at 11s. 7d. and 11s. 6d. per score (20 lb.) respectively, were 5d. and 2d. higher than in May; the index for the former advances by 6 points to 119 and for the latter by 4 point to 112.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	June	June	Mar.	Apr.	May	June
Wheat	67	69	84	85	84	84
Barley	96	94	96	96	105	92
Oats	83	98	84	85	82	82
Fat cattle	94	90	93	92	94	98
„ sheep	138	124	115	128	130	131
Bacon pigs	110	105	112	111	113	119
Pork „	113	103	117	112	108	112
Eggs „	100	107	109	107	109	114
Poultry	126	123	120	115	121	124
Milk	162	162	171	215	162	162
Butter	87	89	95	96	96	98
Cheese	108	98	97	100	103	108
Potatoes	82	137	193	164	174	160
Hay	88	100	81	79	82	83
Wool	82	85	96	97	96	94
Dairy cows	101	100	102	100	101	103
Store cattle	87	92	92	94	96	96
„ sheep	109	100	102	109	107	119
„ pigs	135	115	123	122	118	122

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	120*	109*	125	122	117	117
Fat cattle	—	104	107	106	107	111
General Index	114	117	122	129	120	121

* Superseding figures previously published.

Dairy cows were somewhat dearer than in May, and the index appreciates by 2 points to 103. Store cattle, although slightly cheaper, continues at 96 owing to a similar downward movement during the base period. The index for store pigs,

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which were unchanged in price at 28s. 7d. each, advances from 118 to 122 points, as a reduction of 8d. was recorded in the corresponding months of 1911-13.

Dairy and Poultry Produce. There was no alteration in the contract price for milk, and the index remains at 162. Values for butter were slightly reduced, but a rise of 2 points to 98 occurs in the index owing to a greater decline in the base. Eggs at 10s. per 120 compared with 8s. 11d. a month earlier, and this is reflected in a rise in the index from 109 to 114. In June cheese again averaged 75s. per cwt., but as the base price declined the index advances by 5 points to 108. A slight reduction was recorded in prices for poultry. The index, however, moves from 121 to 124, due to a larger fall in values in 1911-13.

Other Commodities. Potatoes, at £7 10s. 6d. per ton, declined by 5s. 6d. on the month, the index moving downwards by 14 points to 160, the fall being accentuated by a rise during June, 1911-13. Quotations for clover and meadow hay were little altered, the index advancing by 1 point to 83. At 1s. per lb. wool recorded a decline of $\frac{3}{4}$ d., and the index fell from 96 to 94 points.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on Tuesday, July 21, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:

Cambridgeshire and Isle of Ely.—An Order fixing special minimum rates of wages for male and female workers employed on harvest work during the period of the Corn Harvest, 1936. The rate in the case of male workers of 21 years of age and over is a sum of £11 10s. (instead of £11 6s. as in 1935) to cover a period of four weeks of 64 hours per week (excluding Sunday) and, in addition, 11d. per hour for any employment on Sundays and in excess of 64 hours per week. For female workers of 18 years of age and over the rate is 8d. per hour for all time spent on the harvest.

Essex.—An Order fixing special minimum hourly rates of wages for male and female workers employed on the Corn Harvest of 1936. For male workers of 21 years of age and over the minimum rate is 10d. per hour and for female workers of 21 years of age and over 7d. per hour for all time worked on the harvest.

Leicester and Rutland.—An Order varying the existing minimum and overtime rates of wages, the rates as varied to come into force on August 2, 1936. The minimum rates for male workers of 21 years of age and over are 34s. per week of 54 hours throughout the year (instead of 33s. per week of 54 hours as at present) in Leicestershire, and 32s. 6d. per week of 54 hours in summer and 50 hours in winter (instead of 31s. 6d. per week of 54 hours in summer and 51½ hours in winter as at present) in Rutland. The overtime rates in both counties remain unchanged at 9d.

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per hour on weekdays and 11d. per hour on Sundays. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour with overtime at 8d. per hour for Sunday work.

Norfolk.—An Order fixing special minimum and overtime rates of wages for male workers employed on the Corn Harvest of 1936. The minimum rate for male workers of 21 years of age and over employed for the whole harvest period is £11 10s. (instead of £11 as in 1935) to cover all time spent on the harvest. Where the harvest is worked by the month this period is defined as 24 working days (excluding Sundays) and the hours of work are not to exceed 64 during any week in this period. For male workers who are not employed for the full period, special differential rates are fixed for all overtime employment on the Corn Harvest, the rate for male workers of 21 years of age and over being 9½d. per hour.

West Riding of Yorkshire.—An Order varying the existing minimum and overtime rates of wages, the rates as varied to come into force on August 2, 1936. The minimum rates for male workers are—(a) for workers of 21 years of age and over employed as waggoners or other horsemen, beastmen or shepherds, 39s. per week of 52½ hours in summer and 48 hours in winter, with, in addition, not more than 12 hours per week on weekdays and 3 hours on Sundays for work in connection with the care of and attention to stock, and (b) for all other workers of 21 years of age and over 34s. per week of 52½ hours in summer and 48 hours in winter. The minimum rate for female workers of 18 years of age and over is 6d. per hour for a week of 44 hours. The overtime rates for male workers of 21 years of age and over employed as waggoners or other horsemen, beastmen or shepherds are 9d. per hour on weekdays and 10½d. per hour on Sundays, for other male workers 10d. per hour on weekdays and 1s. per hour on Sundays, and for female workers of 18 years of age and over 7½d. per hour on weekdays and 9d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ending July 13, 1936, legal proceedings were taken against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Cornwall ..	Helston ..	£ s. d. 5 0 0	£ s. d. —	£ s. d. 6 6 3	1
Cornwall ..	Helston ..	"	—	—	1
Herts ..	Ware ..	1 15 0	—	3 16 4	5†
Salop ..	Bishops Castle ..	5 0 0	—	40 0 0	1
Carmarthen	Llanfihangel-ar-Arth ..	2 0 0	0 5 0	41 0 0	1
Glamorgan	Llantrisant ..	1 0 0	0 6 6	26 10 0	1
		14 15 0	0 11 6	117 12 7	10

* Dismissed.

† Cases of three workers dismissed.

Foot-and-Mouth Disease.—No outbreak of Foot-and-Mouth Disease has been confirmed since January 26. At the time this issue of the JOURNAL went to press, no part of Great Britain was subject to any restriction in connection with this disease.

WIRELESS TALKS TO FARMERS, AUGUST, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
Regional : August 1	8.0	Mr. Russell Page	Garden Design.
Welsh : August 11	Not fixed	Mr. Charles Fisher	Trout Fishing in South Wales Streams.
Midland : August 4	6.45	Mr. B. K. Vallings (now in charge of campaign against muskrat in Shropshire)	Seeing Life : Cowboy and Packer in Western Canada.
" 19	8.0	Mr. E. Moore Darling	Shrewsbury Floral Fête.
West : August 18	9.35	—	Farmers' Union Debate Outside Broadcast from Long Ashton, near Bristol.
During week beginning August 23	Not fixed		Crowded Moments : Outside Broadcast from Bratton Flower Show.
Scottish : August 2	"	—	Highways and By-ways : Berry-picking at Blairgowrie, Perthshire.
" 5	"	Mr. J. M. Jeffrey, Headmaster of Selkirk High School	Scottish Sweet Pea, Rose and Carnation Society's Show, at Kelvin Hall, Glasgow.
" 5	"	Mr. W. B. Prentice	National Sheepdog Trials at Craigendoran.
" 8	"	Mr. Alfred T. Harrison	August in the Garden.
" 20	"	—	Outside Broadcast from a farm near Crieff, Perthshire.
" 24	"	—	Evening Broadcast from the Zoological Park, Edinburgh.

Bramley's Seedling Apples Wanted.—The Department of Scientific and Industrial Research invites tenders for the supply of 160 tons of Bramley's Seedling apples in minimum quantities of 10 tons, to be delivered to the Ditton Laboratory, East Malling, near Maidstone, Kent, at times to be arranged. The fruit must be of National Mark, Fancy Grade, packed in Standard bushel boxes. Tenders must reach the Superintendent, Ditton Laboratory, East Malling, Kent, not later than August 20, 1936. The Department does not bind itself to accept the lowest or any tender.

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Year Book of Agricultural Co-operation, 1936. Edited by the Horace Plunkett Foundation. Pp. vi & 624. 1936. (London: P. S. King & Son, Ltd. Price 15s.)

The Year-book of Agricultural Co-operation, 1936, seems to be even more comprehensive than its predecessors. Apart from the usual reports on the progress of agricultural co-operation throughout the world, there are interesting articles dealing with special subjects, notably an appreciation of George Russell, and an exhaustive survey of agricultural co-operative insurance by Dr. Barou. The short summary of collectivization in the U.S.S.R. is unfortunately rather sketchy, and attempts no serious critical analysis of what has been done. Finally, there are sections on Legislation of the Year; Books, Surveys and Reports; and a Bibliography of Co-operation: these should be of considerable value to students.

The most interesting feature of the Year-book, however, is the indication it gives of the extent to which the agricultural co-operative movement is modifying and adapting itself to the experiments in State control and producer control of marketing and production which to-day affect, in a greater or lesser degree, almost every country where co-operative methods are established.

It is only lately that co-operators have begun to ask themselves seriously what is their relation to the new order of things. As the author of the very interesting survey of world progress in agricultural co-operation in 1935, says: "The rising strength of many private corporations the co-operative movement could afford to regard as a challenge rather than a menace, but the advance of the State into economic life, and more particularly, into the new life of trade, introduces a force of a different order, and the struggle, if there is to be a struggle, must necessarily be a more uneven affair. The State not only holds political and police powers, even if it does not use them, it sways and is swayed by ideals and emotions which have no economic validity, though they may have vast economic consequences; finally, it can legitimately usurp two of the dearest claims of co-operation—that it eliminates the petty, the wasteful and the competitive in business and that it represents communal and not individual interests."

The author holds—and his view is supported by evidence of co-operative activity in most countries of the world—that co-operation has still its own individual contribution to make; but he implies, nevertheless, that there must be some hard thinking in terms of recent developments and future probabilities. Quoting the statement of the Director of the International Labour Office that "Instead of receding as signs of recovery have appeared, the demand for collective action and organization has, on the contrary, been reinforced," he points out that on this view the relations between co-operation and the State in trade must be of growing importance in the future. He concludes: "While a co-operative movement would be merely spiritless which refused to avail itself of any national power for economic good which circumstances put into its hands, it is very certain that the co-operative movement which becomes a mere tool of the State and sacrifices its age-old privilege of looking, not at nations and Governments, but at humanity, will also have sacrificed its best claim to exist and point a road from the present to the future."

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Nature in Britain. Edited by Henry Williamson. Pp. v + 250, and 143 Figs. (London: B. T. Batsford Ltd. 1936. Price 5s.)

This book is not only good natural history; it is good reading. The six selected contributors, all naturalists of standing and experience, have dealt very competently and pleasantly with their respective subjects. A note on the dust jacket claims that "this book provides, in a compact form and at a wonderfully cheap price, a full introduction to the varied fauna and flora of Great Britain." Actually, it does much more than that; and succeeds where many books of a similar character fail, for it makes its subjects alive and interesting. In addition, there are numerous plates without a poor photograph among them, and many are excellent. As an introduction to the study of wild life, whether for a child or for an adult, the book could hardly be bettered.

Most of the controversial matter appears in Mr. Henry Williamson's introduction. As an example, we may take his dictum that "animals and birds . . . are best to be understood by those despised individuals who humanise them. . . . Judgments, based on feeling, of such 'sentimentalists,' are likely to be truer than those of mediocre science based on observed effect." Mr. Williamson will have no difficulty in finding a host of quite sound naturalists who will disagree *in toto* with this pronouncement, and a great many who hold that the tendency to judge the actions of animals by human standards of feeling and mentality is one of the greatest barriers to the true understanding of their lives and habits. What Mr. Williamson means by "mediocre" science is uncertain, but even science can be quite interesting, and it is possible to write well and interestingly without any excess of sentimentality. Again, concerning the motor-car, Mr. Williamson says: "The swift rubber wheel has directly created an interest in the countryside and its literature, which was certainly not foreseen by the lamenting highbrows." It is only fair to point out that the "swift rubber wheel" also causes the death of hundreds of birds and animals daily, especially during the breeding season, and that it has been the cause, although perhaps indirectly, of much despoliation of the countryside. The majority of motorists are decent, law-abiding folk with a due regard for rural amenities, but there is a minority, distressingly large, that constitutes a danger to all kinds of wild life, and is a curse to the true country lover.

With the technical part of the book, the naturalist can have no serious quarrel. There are, of course, statements that will excite controversy, but a careful perusal of the entire volume has failed to disclose anything to which serious objection could be taken, nor any subject that is not treated in an expert and attractive manner. The book is to be cordially recommended to all Nature lovers, old or young, expert or novice.

The Revival of Agriculture: A Constructive Policy for Britain. Prepared by a Committee of the Rural Reconstruction Association. Pp. 138. (London: George Allen and Unwin Ltd. 1936. Price 3s. 6d.)

This little book appears to be designed partly as a rejoinder to *The Agricultural Dilemma* and to Mr. Menzies Kitchin's *Report on Land Settlement*. The conclusions reached in those works are held to be erroneous, because based on orthodox economics, whereas the Committee responsible for the present work rejects orthodoxy in favour of "realistic" economics.

The Committee considers that Parliament should be relieved of its present concern with the details of agricultural affairs. The responsibility for carrying out agricultural policy should be vested in a national federation

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of agricultural interests, which might have the Minister of Agriculture as its president and take over the work of the various marketing boards, as well as the agricultural activities of the county councils. The aim is to set up unified marketing control in place of the present control by separate commodity organizations which compete with one another for the food market.

The Committee proposes a considerable reduction in imports of food, an increase in home agricultural production almost to the point of self-sufficiency, and a substantial saving in distributive costs through organization. It is hoped that this would lead to a greater consumption by the poorer classes of fresh milk, fruit, eggs and vegetables.

To eliminate price fluctuations, standard prices are to be fixed at an "economic" level, which is to be determined by reference to its effect on the "national life." It is suggested that special methods should be adopted for dealing with surpluses, and that national stores of grain should be established. Production quotas would also be used in order to preserve a balance between the quantities of different commodities produced.

Responsibility for distribution and for the import of foodstuffs would be in the hands of a national distributive trust. Direct producer-retailing might be retained within the general scheme. Finally, a national food council should be set up to exercise a central controlling influence over production, processing and distribution, and assume responsibility for the protection of consumers' interests. This council would bear the ultimate responsibility for scales of prices and minimum rates of wages, and would make recommendations on other questions, such as the proportions of home-produced and imported food in the total supply.

Electricity in Poultry Farming. By C. A. Cameron Brown, B.Sc., A.M.I.E.E. Pp. 73. (Oxford: Institute for Research in Agricultural Engineering. 1935. Price 2s.)

The use of electricity in the operation of modern poultry appliances is becoming more general, especially where production has developed on highly specialized lines and where a new technique, based on mass production principles, has demanded labour-saving devices. The development of the grid system for supplying the country districts with electricity at economic rates has brought about a change in the methods of poultry farming, especially as regards such operations as incubation and chicken rearing, where the supply of cheap and easily obtainable forms of power, light and heat are essential to economic success.

Mr. Cameron Brown, in his useful little manual, deals fully and adequately with the application of electricity to many of the operations on a poultry farm, and, as might be expected, the larger portion of the manual is devoted to the various types and uses of equipment, such as incubators and chick-rearing appliances. In addition, there is useful information with regard to the important question of wiring and a discussion of electricity supply and tariffs.

In the past, the one great objection to the use of electricity in poultry-keeping has been the fear of current failure at a critical time, but this does not appear to have restricted its adoption, especially in England's largest poultry-keeping county—Lancashire. The author has made a careful study of the various practical problems that arise in the application of electricity to poultry-keeping and this publication should be of considerable value to those who contemplate the introduction of electricity on their farms.

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Elementary Veterinary Science. By H. Thompson, M.R.C.V.S. 5th ed. Revised by A. C. Duncan, F.R.C.V.S., B.Sc. Pp. viii + 465, and 85 Figs. (London: Baillière, Tindall and Cox. 1935. Price 10s. 6d.)

This new edition maintains the high standard of its popular predecessor, viz., "Thompson's Veterinary Lectures." It has been arranged in chapters, in place of the lectures in the previous editions, and while much of the old text has wisely been retained, some alteration has been made to bring the book up to date in the light of present-day knowledge. A chapter giving a brief *résumé* of poultry diseases has been added, and certain new diseases are also included. The work contains much information not found in any other single volume, and is admirably suitable for use in agricultural colleges and institutions. As the title indicates, it is obviously not intended for the use of the veterinarian, and no attempt has been made to go into much scientific detail or skilled methods of treatment. Stockowners and students of agriculture will find it valuable and enlightening as a manual of ready reference, and for this purpose it can be highly recommended.

World Consumption of Wool, 1928 to 1935. An Analysis of Consumption and Trade in Wool and Wool Products in the Empire and in Foreign Countries. Prepared in the Intelligence Branch of the Imperial Economic Committee. Pp. 306. (London: His Majesty's Stationery Office. 1936. Price 4s.; post free 4s. 6d.)

This volume is complementary to *Wool Production and Trade, 1928-1934*, published in September, 1935, which dealt with production and export trade in wool. It is a detailed survey of wool consumption, and the trade in wool products, in forty-six different countries. The survey, which is the first attempt to estimate the actual trend of wool consumption in large manufacturing countries, is primarily of interest to the industrialist, and to those engaged in the wool trade in this country and abroad. It should, however, be of interest to farmers and others who are connected with the wool co-operative societies. From the point of view of those who are engaged in growing wool, the most significant fact that emerges from the report is the relatively healthy statistical position of wool. In spite of the restriction of imports by certain important consuming countries, and of the contraction of international trade in wool manufactures, it is apparent that an increasing production of wool and wool tops is being absorbed without serious difficulty, and that the outlook for the immediate future compares favourably with that for many other commodities.

The Pig-Breeders' Annual, 1936. Vol. XVI. Edited by A. Hobson. Pp. 264. (London: National Pig-Breeders' Association. Price 2s. 6d.)

A wide range of subjects is covered by this useful annual publication, which contains chapters on selection, nutrition, management, profit and loss, diseases, a method of judging pork and bacon carcasses, an article on production for the Pig Scheme—including suggestions for the conversion of existing buildings for pig-keeping, and three "Paget Memorial" essays of a high order contributed by young people. "Pigs and Pig-keeping, Past and Present," by W. G. Coates is the title of an interesting historical survey from neolithic times to our own day. In an introductory note Lord Portal, chairman of the Bacon Development Board, emphasizes the point that effective demand for British bacon must ultimately depend on maximum attention to quality. Other features of practical interest are summaries of the results of experiment and research conducted during the past year, and an enlarged "Statistical and Pig Nutrition Section."

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Australian Settlement: Facts and Results in the South East. By Thomas Cherry, M.D., M.S. 3rd ed. Pp. xli + 304. Illus. (London and Melbourne: Humphrey Milford, Oxford University Press. 1935. Price 6s.)

Dr. Cherry opens this study of the agriculture of Victoria with a description of the efforts that have been made to settle unemployed on small freehold holdings in Australia, while permitting them to retain their unemployment benefit during the period of establishment. As he points out, the history of economics is little guide to future development. A radical difference has arisen: bad times in the past were due to shortage of supplies, but the present bad times have been caused by a shortage of customers. Similar attempts to enable the unemployed to provide at least a part of their subsistence from small acreages of land placed at their disposal are being made in a large number of countries, and such efforts, which have proved successful in Australia, may provide some measure of solution to the world-wide economic difficulties.

Following this introductory matter Dr. Cherry gives a very comprehensive survey of Victorian agriculture. Conditions in that country are, of course, essentially different from those in Great Britain, mainly on account of rainfall and climatic conditions, but even in the arid belts adequate provision has now been made nearly everywhere for maintaining water supplies.

The interdependence of sheep and wheat is a marked characteristic of the portion of Victoria with a rainfall of less than 25 inches. The former large sheep-grazing properties are being rapidly subdivided, and, in order to provide an adequate living on the smaller holdings, the area of cultivation has been increased. In other districts of the State, where there is a heavier rainfall, farming takes on a much more mixed character, and it is in these districts that it is hoped to develop closer settlement, with improved methods of farming.

There is an adequate discussion of farm livestock and of the kind of cropping, both summer and winter, that will not only be useful in providing forage, but will serve the purpose of maintaining fertility for arable crops. The book is concluded by a discussion of sheep and pastures, dairy farming and fat cattle, and of irrigation farming. Some attempt is made to envisage the future and prospects of settlers and the conditions under which they must work are described.

Surveys of this kind are extremely useful, not only as a record of the position of farming at the time when the survey is made, but immediately as a guide to those who may be thinking of taking up holdings in the state described.

All About the Soya Bean. By G. D. Gray, M.D., C.B.E. Introd. by J. L. North, late Curator, Royal Botanic Gardens, Regent's Park, London. Pp. ix + 140, and 7 Figs. (London: John Bale, Sons and Danielsson, Ltd. 1936. Price 7s. 6d.)

As recently as last April, an article on the culture of the soya bean in England appeared in this JOURNAL. This gave a synoptic view of the position regarding the possibilities of this crop in British agriculture, and, although it was perhaps not quite so optimistic as the views of the writer of the volume under review, it did indicate that there is a great deal of interest in the possibilities of the crop at the present time.

Whatever the future may hold, any British farmer who grows soya beans will be under an obligation to the pioneer work of Mr. J. L. North, who has spent many years in acclimatizing several varieties of the bean.

Since it is so recently that Sir John Russell's article appeared in this JOURNAL, it is perhaps hardly necessary to make a detailed examination of

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this interesting book; it will be sufficient to say that anyone who is interested in the soya bean would be well advised to read it. Formerly medical officer to the British Legation at Peking, Colonel Gray had exceptional opportunities of studying the part played by the soya bean in the social economy of the Far East. His book deals with the origin and uses of the crop, its successful cultivation in the U.S., its place in manufactures, and suggests infinite possibilities that might result from the introduction of a fully-acclimatized heavy-yielding variety into the farming economy of this country.

Agricultural Botany: Theoretical and Practical. By J. Percival, M.A., Sc.D., F.L.S. 8th ed. Pp. xiv + 839, and 265 Figs. (London: Duckworth. 1936. Price 18s.)

It is essential for the agricultural student to have a thorough knowledge of the classification and special botany of farm crops. These subjects are dealt with in a series of chapters comprising Part IV of the work under review. As an introduction, the chief divisions of the vegetable kingdom are briefly considered, whilst a key and synopsis are given to the principal families under which our crop plants, etc., are classified. This account is followed by several chapters, one or more of which are devoted to each family containing plants of importance on the farm. In this portion of the book, ample information is supplied on the general botanical characters, structure, uses, classification of varieties and culture of such crops as beet, turnips, buckwheat, hops, flax, vetches, potatoes, cereals, etc. Special consideration is usually given to those parts of the plant that are of economic value. The family *Gramineae*, which includes the cereals and the grasses of our pastures and meadows, is dealt with more fully owing to its great importance. The chief races and varieties of oats, barley, rye and wheat are described, and in many instances illustrated, whilst the drawings and descriptions of the commoner grasses of the farm should enable the student to identify them with little difficulty. In the final chapter of this part the proportions of various grasses and clovers used in the formation of temporary and permanent pastures are indicated.

The Parts preceding that on Classification concern External Morphology and Physiology, and these in the main are similar to those of previous editions. Additions have been made in the chapters dealing with cell-division and with reproduction.

The chapter on reproduction includes an outline of the Mendelian Laws of Inheritance. This, within the general scope of the work, is an accurate and reasonably adequate introduction to a subject of increasing importance in agriculture. It would have been useful if definite examples had been given of hybrid plants intermediate between their parents (p. 296), and also of those showing dominant colour and recessive white flowers (p. 294).

The section dealing with fungi in relation to common diseases of plants is the least satisfactory part of the book. It has evidently not been revised since the earlier editions, and is in certain directions out of date and inaccurate. Among potato diseases the well-known *Rhizoctonia Solani* appears to be confused with *R. Crocorum* (p. 717), and the so-called "Early Blight" of potatoes, said to be due to *Macrosporium Solani*, E. and M., is still included, although it is of no importance in this country. The section on the various scabs of potatoes is also out of date, and it would indeed be a fortunate circumstance if the resting sporangia of the Wart Disease organism did remain viable for only two or three, instead of for fifteen, twenty and probably more years. Few plant pathologists would agree with the author in believing that the most extensive damage to potato tubers is due to causes other than attack by the Blight fungus,

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Phytophthora infestans. It may be pointed out also that "Damping off" of seedlings is now known to be due to several fungi in addition to *Pythium de Baryanum*.

An Anthology of Modern Nature Writing. Edited by H. Williamson. Pp. xvi + 276. (London: Thomas Nelson and Sons, Ltd. 1936. Price 3s. 6d.)

An anthology of this character is an ambitious project, and it was inevitable that many names would have to be omitted from the roll of great and near-great nature writers compiled by Mr. Williamson. It is difficult, however, to refrain from expressing regret that space could not be found for Gilbert White and A. E. Coppard. Whatever may be the status of the former as a writer, he was a great naturalist and an observer of the first order. As for Coppard, his writings are among the finest and best informed in all the literature of natural history. Nevertheless, the book is a very acceptable one, and will find an honoured place on the bookshelves of many naturalists. Perhaps few, if any, anthologies of this sort have previously been published.

Some surprise may possibly be occasioned by the inclusion of such authors as D. H. Lawrence, Joseph Conrad and Francis Brett Young, but although none of these was a naturalist in the accepted sense of the term, all of them have given us some very fine descriptive writing on Nature in her various moods and phases. Miss E. L. Turner is the only feminine writer who has a place in Mr. Williamson's gallery, and that is a matter for regret. Are there no other great women writers? What woman has surpassed the rural writings of Mary Webb?

Few readers are likely to quarrel with Mr. Williamson's selection from his subjects' works. They are, indeed, wisely chosen. We may, perhaps, be pardoned for singling out "Bevis' Zodiac" by Richard Jefferies (greatest of all naturalist-authors), "Spring on Dartmoor" by John Galsworthy, and "A Poacher's Life" by H. E. Bates. It may be noted that Mr. Williamson (himself a nature-writer of eminence) has selected from his own works "A Summer Afternoon by the Sea," and surely no one will deny its right to a place of honour in such company. This work contains a rich store for lovers of good writing, whether naturalists or not.

Changes in the Economic Organization of Agriculture. A comparative study of conditions in the Eastern Counties of England in 1933 and 1935. Farm Economics Branch Report No. 23. (Cambridge: The Farm Economics Branch, School of Agriculture. 1936. Price 1s. 6d.; post free, 1s. 8d.)

It is recalled in the Introduction to this report that the Farm Economics Branch of the Cambridge Department of Agriculture carried out in 1931 and 1933 an economic survey of 1,000 farms in the Eastern Counties of England. The results of that survey have already been published. "The present Report represents the first of a new series of publications of which the object is to examine *changes* occurring in farm organization. . . Here *differences* between one year and another will be of more significance than the absolute figures for any one year."

The results given in this report cover an identical sample of 220 farms in the years 1933 and 1935. The report shows that although the average profit obtained in 1935 by these 220 farmers is similar to that of 1933, considerable variations occur in the results recorded for the four types of farming districts from which the sample was taken. The report goes on to show that over all the 220 farms gross income has increased by 14 per cent. and gross charges by 17½ per cent. The increase in income is due

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mainly to larger receipts from pigs, cattle, milk, sheep, hay, potatoes and oats. The increase in gross charges is accounted for by a larger expenditure on feeding stuffs, store livestock, labour, fertilizers, and seeds. It is further observed that the increased output recorded as between the two periods has been effected without a commensurate increase in employment "and the physical output per worker has risen proportionately to that of output per acre."

Reports of this nature are extremely useful and their value will be enhanced when comparisons over longer periods can be made.

Advisory Report on Pig Husbandry and Experiments in Poultry Feeding.

Pp. 100. Illus. (Bath: Bath and West and Southern Counties Society, Pierpont Street. 1936. Price 1s. net.)

This Report is republished by permission of the Bath and West and Southern Counties Society, in whose 1935-36 Journal it was first published. It describes an investigation conducted by Mr. W. T. Price, Agricultural Organizer for Wiltshire, and Mr. A. W. Ling, of the University of Bristol, in the south-west of England for the Bath and West Society.

The Report supplies a most interesting and useful survey of the existing conditions of pig husbandry in the area, and it is likely that many of the main features of this Report reflect general conditions throughout the whole country. It is divided into two parts (i) the investigation, (ii) recommendations. Both parts are subdivided into sections dealing with aspects of the industry; for instance, in Part I headings such as "Type of Farm," "Pig Stock," "Systems of Pig Farming," "Housing," etc., are included, while in Part II recommendations are classified under such headings as "Breeds," "Breeding," "Management and Housing." In both parts there is a section dealing with feeding, and perhaps this will be of the most immediate interest and importance to readers.

The section dealing with experiments on poultry feeding, which has been prepared by Mr. H. F. Burdett, is comparatively brief, but this is to be expected, as it deals only with experiments carried out for one year.

The results of the survey and experiments will best be studied in the Report itself, and copies can be obtained either from the County Council or it can be read in the current issue of the Journal of the Bath and West Society.

Die tschechoslowakische Landwirtschaft: Ihre Grundlagen u. ihre Organisation. (*Czechoslovakian Agriculture: Its Basis and Organization.*) By Dr. E. Reich. *Berichte über Landwirtschaft*. N.F. 108 Sonderheft. pp. 312. Frontispiece and map. (Berlin: Paul Parey, 28 and 29, Hedemannstrasse, S.W.11. 1935. Price RM.13.20.)

The special series of Reports issued by the German Ministry for Nutrition and Agriculture holds a recognized position amongst the world's scientific agricultural publications. The author of the volume under notice is General Secretary to the Czechoslovakian Agricultural Academy, and his work maintains the high standard that has been set by the previous publications in the series.

The book is readable and stimulating. It supplies a review of the existing conditions of farming in the country, points out the interdependence of the various branches of the industry, and gives careful consideration to the relation between the branches and the organization of the whole. Successive chapters deal with the geographical form of the country, the soils in different areas, communications and electrification, domestic industries and the seasonal employment of peasants in industry and the effect upon the intensity of farming, an historical review of the development of economic conditions and forms of ownership, with particular attention to the Eastern portion of the State—i.e., Slovakia and

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Sub-Carpathian Russia. Finally, on the basis of the foregoing, it gives a detailed description of existing methods of production and marketing, existing organization and suggestions for future developments. The whole is supplemented by adequate maps and statistical data.

Particular attention is given to the sociological aspects of the industry, to the idea of establishing a balance between the Eastern and Western regions of the State (the one predominantly agricultural and the other predominantly industrial), the planning and geonomic shaping of agriculture, and in this connexion to the organization of education, technical advisory service and of research.

Studies in Power Farming.—I. *Mechanized Corn-Growing*, by A. Bridges and H. Whitby. II.—*The Cost of Tractor Work*, by J. R. Lee. Pp. 77. (Oxford: Agricultural Economics Research Institute, 1936. Price 2s. 6d.)

The literature of power farming does not diminish in volume, but as the processes involved are comparatively new to this country this is perhaps fortunate. The methods of the power farmer change rapidly as experience is gained, and the discussion here of mechanized corn-growing is a record of what has been achieved in the past ten years and the modifications that have been introduced by those actually engaged in the industry.

As the authors state, this account of mechanized corn-growing on English farms must be regarded as a preliminary statement. When the data collected for the 1935 crop are analyzed more complete information will be available. The present report, however, covers a great deal of ground, and the details given on questions such as cropping, livestock, manuring, labour and harvesting work on the mechanized farms investigated form an essential background to any study made of this subject.

The study of the cost of tractor work, which forms the second part of this little volume, is no less welcome. The volume of accurate information relating to the cost of tractor farming is very slight and much of it is scattered up and down the pages of publications which can only be extracted with time and difficulty. The actual number of costs given here are few. The study relates to the 14-year period 1919-20 to 1932-33 and deals with an average number of farm tractors of between 8 and 9 annually. Although the sample is very small the detail and accuracy with which these records have been kept and subsequently analyzed provide the practical farmer and the student with most useful and helpful data.

The National Farmers' Union Yearbook for 1936. Edited by C. Fyfe, C.B.E. Pp. 516. (London: National Farmers' Union, 45, Bedford Square, W.C.1. Price 5s., post free, 5s. 4d.)

The new issue of this well-known annual, like its predecessors, contains a large amount of useful information for farmers and other agriculturists. A chapter, entitled "Legislation affecting Agriculture during 1935," refers to the British Sugar (Subsidy), Cattle Industry (Emergency Provisions) and Diseases of Animals Acts, and other important measures. The statistical abstract and transport miscellany have been revised and brought up to date. "Recent Developments of Farm Machinery" is the subject of an interesting article by Mr. Thompson Close, the Ministry's Agricultural Machinery Officer, while Mr. C. H. Tolley writes on the "Farmers' Income Tax." Marketing schemes during the past year are dealt with very fully, and there are chapters on agricultural education, research, tithe rentcharge, meteorological conditions, fertilizers and feeding stuffs. The value of the publication is enhanced by a comprehensive index.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

- Darley, H. C. (Editor).*—Historical Geography of England before A.D. 1800, with contributions by E. G. Bowen, E. W. Gilbert, S. W. Wooldridge, and Others. (xii + 566 pp.) Cambridge, at the University Press, 1936, 25s.
- Nature in Britain.*—An Illustrated Survey, with contributions by R. St. B. Baker, E. G. Boulenger, L. C. Bushby, R. and E. Gathorne-Hardy, S. Gordon and Frances Pitt. (Introduction by H. Williamson.) (250 pp. + 97 pp. plates.) London: B. T. Batsford, 1936, 5s.
- Williamson, H.*—An Anthology of Modern Nature Writing. (xvi + 277 pp.) London: T. Nelson & Sons, 1936, 3s. 6d.
- Hall, Sir A. D.*—The Improvement of Native Agriculture in Relation to Population and Public Health. (vi + 104 pp.) Oxford University Press. London: H. Milford, 1936, 10s. 6d.
- South Australia Department of Agriculture.* Bulletin 310. Agriculture in the Temperate and Sub-Tropical Climates of the South (New Zealand, Chile, Argentina, Uruguay, Southern Brazil, South Africa). (190 pp.) Adelaide, 1935.
- Straits Settlements and Federated Malay States Department of Agriculture.* Malayan Planting Manual No. 2. An Outline of Malayan Agriculture, D. H. Grist. (xii + 377 pp. + 2 maps + 88 pp. plates.) Kuala Lumpur, 1936, \$3.
- United States Department of Agriculture.*—Library Bibliographical Contributions No. 22. (Edition 2):—George Washington and Agriculture. A Classified List of Annotated References with an Introductory Note. (v + 77 pp. typescript.) Washington, D.C., 1936.
- United States Department of Agriculture.*—Library Bibliographical Contributions No. 26.—Selected References on the History of Agriculture in the United States. (v + 28 pp. typescript.) Washington, D.C., 1935.
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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATIONAL STAFFS: ENGLAND

- Cumberland and Westmorland:** Miss W. D. Parlett, N.D.P., has been appointed County Poultry Instructor, *vice* Mr. M. B. Smithson.
Devonshire: Mr. H. W. Sayer has been appointed Assistant Instructor in Horticulture.
Shropshire: Miss K. Thompson, N.D.P., has been appointed Assistant Poultry Instructor, *vice* Miss M. L. Sinclair.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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NOTES FOR THE MONTH

Tithe Act, 1936

THE Tithe Act, 1936,* received the Royal Assent on July 31, and in consequence of the passing of the Act the main functions of the Ministry under the Tithe Acts come to an end. In accordance with the provisions of the Act, the Tithe Redemption Commission has been constituted. The Lords Commissioners of His Majesty's Treasury, after consultation with the Minister of Agriculture, have appointed Sir Charles John Howell Thomas, K.C.B., K.C.M.G., late Permanent Secretary of the Ministry, to be Chairman of the Commission; and the following, who will act in an honorary capacity, have been appointed to be members:—

Mr. WILLIAM ALLEN, K.C.

Mr. ARTHUR EDWIN CUTFORTH, C.B.E., F.C.A.

Mr. EDWIN FISHER, and

Sir NORMAN VERNON, Bt.

The first meeting of the Commission was held on August 5, 1936, when the Commission appointed Mr. H. G. Richardson, formerly Assistant Secretary of the Ministry of Agriculture and Fisheries, to be its Secretary.

Rules under Section 5 of the Tithe Act, 1936, have been made by the Minister of Agriculture and Fisheries, prescribing the form in which particulars are to be transmitted to the Tithe Redemption Commission by owners of tithe rent-charges.†

Applications for supplies of the Form on which the particulars are to be transmitted should be addressed, by

* Copies may be obtained, price 1s. 3d., post free 1s. 4d., from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

† Copies of the Rules (Statutory Rules and Orders, 1936, No. 775) may be obtained (price 2d., post free 2½d.) from H.M. Stationery Office, or through any bookseller.

NOTES FOR THE MONTH

letter only, to the Secretary of the Commission, at Eagle House, Cannon Street, E.C.4.

A separate Form will be required in respect of each Tithe District for which there was a separate Tithe Apportionment under the Tithe Act, 1836, and in estimating the number of sheets of the Form that will be required, it may be taken that there will be space on each sheet sufficient for, on the average, 25 tithe rentcharges.

Owners of tithe rentcharges are reminded that the Tithe Act, 1936, requires that particulars, in writing, of the tithe rentcharges in respect of which compensation is claimed, shall be transmitted to the Commission not later than October 31, 1936. It is desirable that the Form should be transmitted as early as possible before that date.

The Problem of Nutrition*

At the last Assembly of the League of Nations, Mr. Bruce, the principal delegate for Australia, proposed a world-wide survey of the problem of nutrition. The Health Organization of the League had already done useful work in bringing together the results of recent scientific discoveries as to the connexion between certain forms of ill-health and improper or inadequate feeding, and the International Labour Office have shown from their study of family budgets that a considerable proportion of the population in all countries is not obtaining a diet adequate for perfect health. The possibilities of improving public health in all countries by better feeding have aroused increasing interest in many parts of the world, and the discussions at the Assembly showed that the problem had many ramifications in relation not only to medicine and public health but to agriculture, commercial policy and social organization. The Assembly accordingly appointed a mixed committee of medical, agricultural and economic experts, under the Chairmanship of Lord Astor, to examine the question in all its bearings.

In their Interim Report on the Problem of Nutrition the Mixed Committee have covered a very wide field, but in the

* *The Problem of Nutrition: A World Survey by a Committee of the League of Nations.*—Vol. I.—“Interim Report of the Mixed Committee on the Problem of Nutrition.” (Price 2s.). Vol. II.—“Report on the Physiological Bases of Nutrition by the Technical Commission of the Health Committee.” (Price 6d.). Vol. III.—“Nutrition in Various Countries.” (Price 5s. 6d.). (Geneva: League of Nations Publications Department; London: Allen & Unwin.)

NOTES FOR THE MONTH

time available they have been unable to do more than make preliminary observations on the agricultural and economic aspects of the problem. The intention is to elaborate these in a later report. Volume I explains, in language intelligible to the layman, the principles of correct nutrition as expounded in the Report of the Technical Commission contained in Volume II, which is written primarily for the expert. The need for vitamins and mineral salts is specially emphasized, and the foods rich in these constituents are listed and designated "protective foodstuffs." Of the foods in this list, milk receives special emphasis owing to its paramount importance for the nutrition of pregnant and nursing mothers, infants, children and adolescents. Volume III gives a useful compendium of information as to the state of nutrition and measures taken to improve it in various countries.

The Report states that, owing to the fall in agricultural prices, malnutrition even in agricultural countries has become severe, since producers have been unable to find a profitable market for their goods; and the lack of purchasing power of agricultural communities has reduced the demand for the products of industry, with a resultant stagnation of trade. It is pointed out that the most common deficiencies prevalent in European countries can be remedied by increased consumption of perishable products which by their nature are specially suitable for local production, i.e., milk, vegetables and fruit. If European agriculture were to produce less cereals and more protective foods, as the nutritional experts recommend, this would help to restore international trade in foodstuffs which can be more economically obtained from oversea countries.

The Committee have not entered into any detailed examination of the existing commercial and agricultural policies of European countries, but have drawn attention to certain of the effects of these policies on national nutrition. The depression is not the cause of malnutrition; but, in some countries and in some sections of the community, it has intensified the evil owing to a reduction of the standard of living and the restrictions that have been placed on the exchange of products.

Special attention is drawn to the spread between the prices paid to the farmer and those paid by the consumer for agricultural products. While it is realized that a reduction of these margins is a very difficult matter, the Committee recommends the creation of more adequate marketing facilities and the

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encouragement of more efficient marketing organization. From the standpoint of national policy, the problem consists of reconciling the interests of the poorer consumers, who require a cheap and abundant food supply, with the interests of food producers, who need to maintain and improve their standard of living.

The Mixed Committee are suggesting to the Assembly of the League that they should recommend Governments to continue the study of nutrition in relation to optimum health: to consider what steps can be taken by education and otherwise to improve the nutrition of sections of the community with low incomes and particularly to ensure adequate supplies of safe milk for expectant and nursing mothers, infants, children and adolescents; and to take steps to improve and cheapen marketing and distribution of foodstuffs so that protective foods may be as far as possible available to all.

The Hofius Process of Milk Preservation

THE following note has been communicated by Dr. A. T. R. Mattick, National Institute for Research in Dairying, Shinfield, near Reading.

The Hofius process for preserving milk, which is now in use in Germany and other Continental countries, is based on the fact that oxygen under pressure will kill or check the growth of bacteria.

The apparatus consists, briefly, of a strong stainless-steel cylinder, to which is attached a massive head fitted with the necessary valves for the admission of oxygen and for the withdrawal of the milk or cream as required for use. The milk for preservation is filled into the cylinder after the removal of the head. The latter is then replaced and screwed into position by means of a special spanner. All joints are gas tight and built to withstand pressure.

After the raw or pasteurized milk at 43° F. has been introduced, it is shaken thoroughly and the valves opened to release gases from the milk. Oxygen from an ordinary commercial cylinder is then admitted through the valve on the cylinder head, the milk again shaken, the pressure released to complete the displacement of milk gases—a fresh charge of oxygen admitted until the pressure in the gauge reaches 10 atmospheres and the cylinder put into cold store at 43° F. The milk is then shaken daily to incorporate cream and distribute the gas, and can be withdrawn as required by

NOTES FOR THE MONTH

merely releasing the discharge valve and receiving it into a container.

Under the conditions described, the milk remains in a sweet condition for weeks. At first the bacterial count decreases, and the acidity does not change. Eventually the acidity rises and the count gradually increases. The surviving flora tends to be monospecific, as only certain kinds of organisms appear to be capable of growing under these conditions. Coliform organisms are, apparently, unable to survive.

Sampling Observations on Wheat, 1935-36 : Report for Third Quarter

THE observations for this quarter cover the period from tillering to ear emergence. The table gives the date and the state of the crop at each of the three principal stages of development during this period: (1) maximum shoot-density; (2) maximum growth-rate; (3) ear emergence.

The present season's observations are of particular interest, in that the weather conditions have been markedly different from those of the three previous seasons. The most striking feature up to the date of tillering was the unusually slow progress of the plant compared with those three seasons. The weather during the present quarter has not favoured rapid progress, and development continues to be late.

The dates of maximum shoot-density varied from April 1 for the two standard varieties at Seale-Hayne to June 5 for Yeoman at Boghall. Early dates are associated with high plant-densities at tillering. This is partly due to the fact that with a low plant-density at tillering, as occurred at Newport, Plumpton and Cirencester this year, each plant produces on an average more tillers than with a high plant-density. The ratio of maximum shoot number to plant number at tillering was about 2 : 8 for the average of the two standard varieties at stations with a high plant-density at tillering and about 3 : 7 at stations with a low plant-density. At Newport, where the plant number was very low, the ratio was actually 5 : 3 for Squarehead's Master and 6 : 4 for Yeoman, being consistently higher for Yeoman at all stations. The maximum shoot numbers varied from 2,093 per 32 metres for Squarehead's Master at Newport to 6,182 for Yeoman at Seale-Hayne. The range has been practically the same in all four years.

The date of maximum growth rate varied from May 27 to

NOTES FOR THE MONTH

SAMPLING OBSERVATIONS ON WHEAT, 1935-36. THIRD QUARTER.

Station	Maximum Shoot Density			Maximum Growth Rate			Ear Emergence			
	Variety	Date	Shoot Density per 32 m.	Shoot height cm.	Date	Rate cm. per day	Shoot Density per 32 m.	Shoot height cm.	S.E. of diff. of rate	Rate % per day
CARRINGTON, Gloucestershire	S.H.M.*	May 11.76	3,200	10.38	June 14.07	1.57	1,367	47.24	—	11.7
	Yeoman	May 14.13	3,683	6.91	June 24.52	1.53	1,555	53.10	—	10.7
	Victor	May 13.48	2,641	8.75	June 22.45	1.57	1,320	55.76	—	7.8
LONE SUTTON, Hampshire	S.H.M.	Apr. 15.92	3,772	—	—	—	—	—	± 0.500	14.2
	Yeoman	Apr. 14.19	4,528	—	—	—	—	—	± 1.95	14.7
SROUSTON, Norfolk	S.H.M.	Apr. 14.05	3,120	3.05	June 6.33	2.70	1,718	44.47	± 0.170	13.2
	Yeoman	Apr. 19.68	3,382	2.59	June 7.05	2.22	1,868	36.27	± 0.170	14.0
WOBURN, Bedfordshire	S.H.M.	Apr. 4.03	4,158	—	June 5.54	2.10	2,018	40.29	± 0.0871	20.3
	Yeoman	Apr. 13.47	4,167	1.65	June 7.26	1.94	2,237	34.13	± 0.0871	25.0
SCALE-HAYNE, Devonshire	S.H.M.	Apr. 1.91	5,485	—	June 2.19	1.46	2,395	50.01	± 0.176	11.6
	Yeoman	Apr. 1.17	6,182	—	June 2.93	1.36	2,850	36.87	—	—
GARTON'S No. 60	Garton's	Apr. 3.51	4,743	—	May 27.64	1.58	2,447	42.50	± 0.176	10.4
	No. 60	—	—	—	—	—	—	—	± 0.589	—
ROTHAMSTED, Hertfordshire	S.H.M.	Apr. 10.62	3,617	—	June 8.02	2.64	1,784	47.26	± 0.315	13.0
	Yeoman	Apr. 11.32	4,175	—	June 9.13	2.27	2,138	40.07	± 1.15	15.7
NEWPORT, Shropshire	S.H.M.	Apr. 20.92	3,114	2.04	June 10.32	2.53	1,758	48.23	± 0.595	16.9
	Yeoman	May 20.81	2,093	15.82	June 23.09	3.13	1,734	86.56	± 0.153	11.7
PUNFURTON, Sussex	S.H.M.	May 24.95	2,437	15.45	June 25.04	3.06	1,436	75.94	± 0.283	12.6
	Yeoman	May 26.55	2,227	—	June 8.00	2.32	1,212	41.83	± 1.01	11.7
BOCHALL, Edinburgh	S.H.M.	Apr. 29.35	2,526	—	June 21.02	1.92	1,216	54.93	—	15.0
	Yeoman	May 31.80	2,570	—	June 23.18	2.73	2,256	34.37	—	8.6
WYRE, Kent	S.H.M.	Apr. 11.52	2,735	6.18	June 27.03	1.90	2,398	31.89	—	9.4
	Yeoman	Apr. 17.15	3,219	—	June 9.77	1.84	2,105	40.46	—	13.4
WYRE, Kent	S.H.M.	Apr. 17.15	3,679	—	June 11.28	1.76	2,298	32.86	—	16.6
	Yeoman	—	—	—	—	—	—	—	—	—

* Squarehead's Master.

† Based on 16 instead of 32 metres.

† Yeoman significantly higher than Squarehead's Master or Garton's No. 60. Stations are arranged in order of sowing date.

NOTES FOR THE MONTH

June 27, this range being larger than in any of the three previous years. The shoot heights at this date lay generally between 40 and 50 cm. and the rates of increase per day between 1.5 and 2.5 cm. The rather sparse crop at Newport was an exception, the shoot height at maximum growth rate being 87 cm. for Squarehead's Master and 76 cm. for Yeoman, and the rates of increase just over 3 cm. per day. The range of shoot densities was from 1,134 to 2,850 per 32 metres.

The dates were earlier for Squarehead's Master than for Yeoman at eight of the nine stations at which the rate was determined, and the rates of growth higher at all nine. These differences have appeared consistently every year.

The dates of ear emergence varied from June 20 to July 7. Squarehead's Master emerged earlier than Yeoman except, possibly, at Seale-Hayne. At three stations, Cirencester, Boghall and Wye, the differences in date were sufficiently large that no standard error was necessary. Rates generally were about the same as last year. The rate of emergence was lower for Squarehead's Master than for Yeoman at nine stations. Shoot heights varied from 50 cm. for Yeoman at Boghall to 93 cm. for Squarehead's Master at Newport. The average difference in height between Squarehead's Master and Yeoman was about 11 cm., about the same as in previous years, except at Cirencester and Boghall, at which it was only 2.6 and 3.6 cm. respectively this year.

The observations for this quarter have been very satisfactory, the principal omissions from the table on account of incomplete data being the maximum growth rate at Long Sutton and the ear emergence for Yeoman at Seale-Hayne.

Agricultural Wages (Regulation) Act, 1924: Report of Proceedings, 1934-35

THE Ministry has recently issued a Report of Proceedings under the Agricultural Wages (Regulation) Act, 1924; for the year ended September 30, 1935. The Report reviews the work of the Agricultural Wages Board and of the Agricultural Wages Committees during the period and contains full details of the minimum rates of wages for agricultural workers as fixed by the Committees. In addition, the Report deals with the results of the investigations made by the Ministry's Inspectors for the purpose of securing the proper observance of the minimum rates, and with the state of employment in agriculture and the demand for labour.

NOTES FOR THE MONTH

The Report is obtainable through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s., post free 1s. 1d.

The Secretary of the Ministry

SIR CHARLES HOWELL THOMAS, K.C.B., K.C.M.G., retired on August 31 from the post of Permanent Secretary of the Ministry of Agriculture and Fisheries, which he had occupied since August, 1927. He has been succeeded by Mr. J. D. B. Fergusson, C.B., formerly Principal Private Secretary to the Chancellor of the Exchequer. Sir Charles, as recorded on page 513, has been appointed Chairman of the Tithe Redemption Commission.

United Dairies' Scholarships, 1936-37

THE United Dairies' Scholarships awarded for the year 1936-37, the colleges at which they are tenable, and the names of the successful candidates (with the schools at which they were educated) have been announced as follows:—

TENABLE AT READING UNIVERSITY:

3-YEAR DEGREE (*B.Sc. Agric.*) COURSE—

Richard Charles Honey, St. Newlyn East, Newquay (Newquay County School).

Leonard John Anstey, Frome (The County School, Frome).

3-YEAR DEGREE (*B.Sc. Dairying*) COURSE—

Nancy Louise Greed, Spaxton, Bridgwater (Bridgwater County School).

TENABLE AT SOMERSET FARM INSTITUTE, CANNINGTON:

2-YEAR DAIRYING COURSE—

Betty Joan Way, Poorton, Melplash, Dorset (Dorset County School).

Hilda Mary Creed, Seaborough, Dorset (West Crewkerne County School).

Betty Mary Hutchings, Wrington, near Bristol (Sunny Hill School, Bruton).

Edith Withers, Donyatt, Ilminster (Ilminster Grammar School).

These scholarships, which are awarded annually, are provided from the Fund created, in 1924, by United Dairies, Ltd., for the purpose of promoting and encouraging practical and scientific education in dairying and dairy farming. They are available for the sons and daughters of farmers and smallholders in the counties of Cornwall, Devon, Dorset and Somerset, and are tenable at various agricultural centres of education.

LAND DRAINAGE: THE AREA OF BENEFIT

B. A. KEEN, D.Sc., F.R.S.,

Assistant Director, Rothamsted Experimental Station.

PRIOR to the Land Drainage Act of 1930, drainage legislation was of a piecemeal character. There were numerous authorities, with varied powers and duties, which had, however, one feature in common—no responsibility for the water directly it had passed the boundary of their limited area.

Following the passing of the Land Drainage Act, 1918, an attempt was made to set up more comprehensive authorities, and, up to 1927, 55 new drainage districts, covering an area of 900,555 acres, had been constituted. Of this total, one authority (the Great Ouse) accounted for 484,963 acres. All these districts were based on the assumption that lands up to 8 ft. above the highest recorded flood level were capable of receiving benefit from drainage works, except in the case of lands liable to tidal inundation, where 5 ft. above tide level was adopted as the boundary. This assumption was argued by Counsel and technical witnesses before committees of both Houses of Parliament during the passage through Parliament of the Land Drainage (Ouse) Provisional Order Confirmation Act, 1920, under which the Ouse Drainage District of that year was constituted.

The Report of the Royal Commission on Land Drainage, presided over by Lord Bledisloe in 1927, showed that under the conditions then existing, the interests of neighbouring authorities were in conflict, whereas they obviously ought to be in common. As a result the Land Drainage Act of 1930 became law, and watercourses of all kinds from field to sea have been brought under jurisdiction.

One very important provision of the Act is that Catchment Boards are required to bring within the jurisdiction of Internal Drainage Boards only those areas which, to quote the Act, "derive benefit or avoid danger" as a result of drainage operations. Some working rule for defining such areas had to be adopted, and the pre-1930 practice of including all land up to the contour line drawn 8 ft. higher than the level of the highest recorded flood (except in tidal areas) was

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continued. At a later date, however, the Ministry, in the light of experience, decided that certain adjustments in its policy were desirable, with the result that, in built-up areas, the flood level itself was adopted as the limit of benefit.

The adoption since 1918 of the 8 ft. line for agricultural land has increased the area on which rates can be levied, thus bringing within drainage districts lands that were totally or partially outside the areas of the older drainage authorities. The objection of the occupiers to inclusion is understandable, especially in instances where the existing drainage works are adequate and no fresh constructions are contemplated. Their response to the explanation that the land is henceforward to bear its fair share of benefits hitherto received free, is the very natural one of denying that it benefits in any way: in other words they suggest that a lower contour than 8 ft., or even flood level itself, should be taken.

The Royal Commission, in considering the evidence which they had received on the subject of the area of benefit, contented themselves with the following statement:—

“ . . . the Ministry of Agriculture and Fisheries, in setting up Drainage Boards under the Land Drainage Act, 1918, had to consider what boundary line they could adopt, having regard to the principle of ‘no benefit, no rate.’ We are informed that the Ministry took the best agricultural and engineering advice which was available and decided to bring within the area of rating for drainage purposes all land up to 8ft. above the highest known flood.”

The adoption by the Ministry, after 1918, of the 8 ft. above the highest known flood, was undoubtedly somewhat of a novelty because, prior to that date, the practice had been to confine drainage districts to flood level, or from 1875 onwards, as in the case of the Thames Valley, to go up to 5 ft. above flood level, although there are numerous instances here and there where land is now liable to be rated for drainage rates under some old enactments, which is far above any of these levels.

The purpose of this article is to show that the 8 ft. line is a fair and reasonable limit to adopt for agricultural land. The argument must necessarily be couched in general terms; but it will show that, in average conditions, land up to the 8 ft. contour benefits from adequate drainage. It is not to be expected that the 8 ft. line is a rigid one clearly marking the upper limit of benefit; the complexity of soil types and distribution, and variations in topography, are such, that, for practical purposes, an average value must be assumed. The

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Act of 1930 makes ample provision for meeting special cases, either by exclusion or by differential rating.

The first step in the argument is to consider what happens to the rain. Part may run off, on or through the surface soil, to ponds or ditches: the remainder enters the soil. Of this, some will be retained by the soil and the rest will percolate downwards and find its way by natural drainage (or constructed drains) either to a stream, or to the underground-water-table, which may be close below the soil surface, or hundreds of feet below. In this country, with its adequate and well-distributed rainfall, the annual precipitation exceeds what the soil can hold. The surplus must be drained away from the region inhabited by plant roots, either by natural or artificial means, or both, if the soil is to be maintained in the best condition for agricultural or pastoral purposes. The records of the Rothamsted drain gauges show that, for bare loam soil under an average annual rainfall of about 30 in., approximately 50 per cent. of the rain percolates below the 5 ft. depth. Obviously, the percolation through soil carrying a crop will be less, but there is still a surplus which must be drained away, which is estimated to be equivalent to about 10 in. of rain.

The water that plant roots utilize is that held by the soil. The particles in the upper layers of a properly-managed soil form loose aggregates or crumbs—described by the farmer as good tilth—which behave towards water much as a sponge. They have a high water-holding capacity and can be regarded as innumerable little water reservoirs for the use of plant roots. In the lower depths of soil, where the crumb structure is largely absent, the water is held mainly as little rings surrounding the points of contact of adjacent soil grains, and in the pore-spaces between the grains; these pore-spaces will in general be only partially full of water when drainage has ceased.

The moisture content of the soil is depleted by evaporation into the air and by the requirements of vegetation. When rain falls on the surface, each successive layer of soil aggregates refills its interstices from the new supply; the surplus passes on downwards and continually suffers diminution as each successive layer levies toll on it. If the rainfall is slight, the whole of it may be absorbed by the soil—a not uncommon occurrence in summer—but the usual condition, over the greater part of the year, is for more rain to be

LAND DRAINAGE: THE AREA OF BENEFIT

available than can be held in the upper and lower depths of soil. The surplus constitutes the drainage or percolation water, and there are two reasons that make it desirable for the percolation to be evacuated as rapidly as possible.

First, the aeration of the soil is effected through the pore-spaces: through them, the carbon-dioxide gas produced by the growth activities of roots and micro-organisms escapes into the atmosphere and is replaced by oxygen. If the pore-spaces are choked with surplus water, the gaseous inter-diffusion of oxygen and carbon-dioxide is diminished and plant growth may be adversely affected; crops in this "drowned" condition are suffocating for want of air.

Secondly, in conditions of impeded drainage, the crumbs disintegrate, the soil falls into bad tilth and becomes more impervious to the passage of both air and water. Soil in this state is difficult to cultivate and does not provide the best conditions for plant growth.

Although there is an important change in perspective, there is nothing new in the above conception of the soil as a kind of porous framework, retaining within its interstices (especially those permeating the crumbs) a certain proportion of the rain and permitting the surplus to escape downwards as percolation. But there is still some misconception about the way in which the plant roots obtain their moisture. Absorption of water by the root reduces the soil moisture content in the immediate neighbourhood, and water tends to move into the depleted zone from the surrounding regions of higher moisture content. Although no experimental proof was ever given it was assumed that such movement extended over considerable distances. It is now known that not only is the distance very limited but also that the rate of movement is very slow. The truer picture is that the soil moisture remains relatively stationary, while the plant's ramifying root system traverses the soil so thoroughly that no part of the water is far removed from an absorbing region.

Recent studies show that the root systems of common agricultural plants extend deeper than is usually supposed. The depth varies with the variety of plant, the type of soil and the meteorological conditions, but the following figures are typical: wheat, oats, and sugar-beet, 5-6 ft.; barley, 3-4 ft.; potatoes, 3 ft. Hence, when the water-table is sufficiently below the surface for a 5-foot depth of freely-draining soil to be available for the roots to traverse, this depth of soil can be

LAND DRAINAGE: THE AREA OF BENEFIT

pictured as containing innumerable small reservoirs of water, each being within a short distance of an absorbing root-hair. A 5-foot depth of soil holds water equivalent to $7\frac{1}{2}$ in. of rain at least.

In periods of drought, the soil-moisture is progressively depleted, and the question arises whether at these times the soil can draw on the underground-water-table. Because of the above-mentioned misconception of the distance and speed of water movement in soil, there still exists a belief that water will rise by capillarity to a considerable height above the underground-water-table. This is not so. Experiment shows that, even in conditions of continuous drought, the maximum height of capillary rise is only 3-4 ft. in a heavy loam soil, while for lighter soils the height is, of course, less. Therefore, assuming the maximum capillary rise to be 3-4 ft., and taking 5-6 ft. as the depth of soil inhabited by roots of agricultural plants, it follows that a water-table more than 8-10 ft. (the sum of these two quantities) below the soil surface is, for practical purposes, incapable of supplying water by capillary rise to the roots.

Consider, now, the conditions in a valley. Near the stream the underground-water-level will approximately coincide with stream-level. Proceeding away from the stream, the land level will rise and so will the underground-water-level, but at a lesser angle; hence, the farther one proceeds up the side of the valley the greater is the depth of the underground-water-level below the surface.

In fields near the stream there is only a shallow depth of drained soil for plant roots to inhabit. In spite of this, they will not suffer from drought because the underground water is close below; but a temporary rise in the level may check root activity because the shallow depth of soil will rapidly become nearly full of capillary water, thus reducing aeration and also causing deterioration in the soil structure. This effect will be progressively reduced the farther one proceeds up the side of the valley until, where the underground-water-level is 8-10 ft. below the surface, the plant roots will have the full 5-6 ft. zone for development before reaching the top of the 3-4 ft. zone of capillary rise. It follows, therefore, that everywhere from this point down to the stream, plants are liable to suffer if the underground-water-level is not kept as low as possible, and therefore, lands whose underground-water-level is 8 ft. or less below the surface are

LAND DRAINAGE: THE AREA OF BENEFIT

benefited by drainage works that provide for the regular and orderly evacuation of surplus water.

It would be impracticable to trace the 8 ft. underground-water contour by a series of borings; some simpler and less costly procedure must be used for administrative purposes. The only practical alternative is to strike a contour on the soil surface a given vertical distance above stream-level, and it is clear that the vertical distance employed could legitimately exceed 8 ft., since the underground-water-level is itself inclined upward from the stream. Nevertheless, the 8 ft. contour is employed in practice, thus excluding from the rateable area a marginal fringe of land that could quite fairly be brought in.

The practice of measuring the 8 ft. contour, not from the stream-level but from the points reached by the highest recorded flood, is also quite justifiable. A flood "banks up" the drainage water that is flowing along the underground-water-contour to the stream and thus progressively raises the underground-water-level in the higher unflooded land. Even though the visible flood may subside quickly, the land it covered will remain saturated for some longer time and so the banked-up water in the higher land will only slowly subside. In addition, there may be deterioration in the tilth of the land that has been flooded, so that it drains less freely than before, and the increased resistance to water movement still further reduces the rate at which the banked-up underground-water in the higher lands can subside.

The direct effects of a flood on the land it covered are clearly visible; but its indirect effects on the higher unflooded land are at least as important.

ELECTRICITY SUPPLY AND THE FARMER

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THERE are now in this country between 20,000 and 25,000 farms supplied with electricity from mains systems. These systems are chiefly owned by private companies or by municipal authorities who have between them taken up all the best areas of supply—best, that is, from the point of view of profit earning—and some of the worst areas. In certain instances public boards have been formed to supply unattractive and unallotted areas, and in one county at least the County Council has taken the responsibility of supply. The enterprise of the Dumfries County Council is being watched with great interest because of the supply being in the hands of the one body most likely to have the interests of rural consumers most in mind.

The past five years have seen a substantial improvement in the condition of electricity supply in rural areas. Apart from the actual numbers connected, there has been an improvement in the attitude of the supply companies to the farmers and of the farmers to the supply companies. At the same time, there still exist certain irritations and apparent anomalies that do not help the smooth development of rural supply. For instance, one hindrance has been the power allotted to urban districts to cut themselves off from any wider interest and to form a self-contained supply district, oblivious of the needs of the rural district outside their boundary. There is, too, a persisting tendency on the part of some farmers to under-estimate the technical and financial difficulties of rural supply, and much of their grievance can be traced to a misunderstanding of the nature, function and possibilities of the different kinds of electrical lines that may come within tantalizing but untouchable reach of an unsupplied farm.

There are first of all the "Grid" lines belonging to the Central Electricity Board and swooping from pylon to pylon across country with a magnificent disregard for local fears or feelings, but committing little desecration on the whole. These lines have nothing to do with electricity distribution as such;

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they are really units in the scheme of generation, linking up one power station to another as, in the power station, itself, solid strips of copper link up one switch-cubicle to another. There was never any intention that the Grid lines should be tapped to supply small towns, much less villages and farms. The once-popular conception of the Grid lighting up remote farm and cottage was a fanciful one of lay birth and never countenanced by the technical men. It may, however, be some compensation to the lonely but modern-minded farmer, seated candle-lit beneath its span, to feel that the Grid was a wonderful conception, magnificently executed, and so regarded by all the world. The system has its faults, no doubt, but an inability to heed the humble farmer is not, in all justice, to be reckoned as one.

Next come the high-tension transmission lines which are generally to be recognized by having three wires in a triangular formation with sometimes a fourth wire beneath. Wooden poles are customary, but small pylons, steel or concrete towers, are sometimes used. These lines link up the tapping points of the Grid with towns and large villages that require supply; they are run at high pressures up to 33,000 volts and can be tapped to supply isolated farms. The subsidiary transmission lines are similar but run at lower pressures—often 11,000 volts—and wander about from village to village. They are prepared to supply anybody, but the cost of making an individual tapping is appreciable. The cost of a 25 kw. tapping, that is, the switchgear and a transformer to reduce the voltage to 400 volts and downwards, would be of the order of £100: a similar tapping on the 33,000 volt line would cost about double this.

Finally comes the low-tension distribution system, which connects the individual premises in a community and supplies electricity at usable pressures. These low-tension lines are recognizable by the heavier wires usually carried vertically above each other, in sets of four wires when pressures of 230 volts single-phase and 400 volts three-phase are available; of three wires when 200 and 400 volts single-phase are available; and of two wires when only 230 volts single-phase are available.

The low-tension distribution system is fed from a transformer connected to the transmission lines but cannot extend very far away from the transformer for technical reasons; if this is not observed the consumers at the far end will suffer

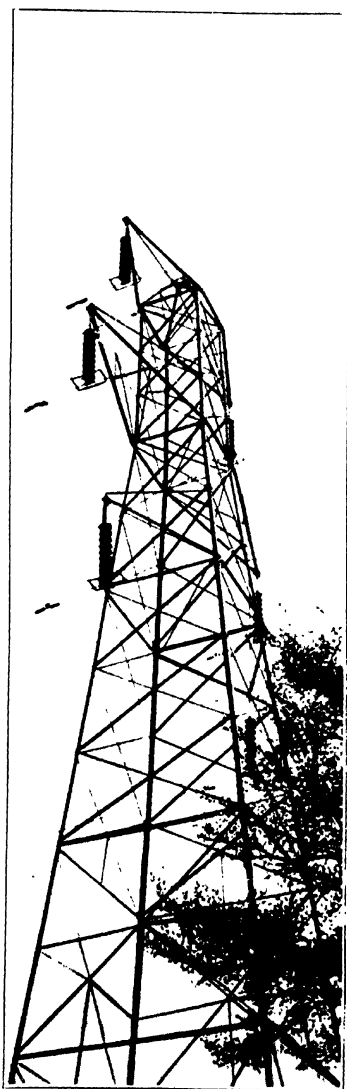
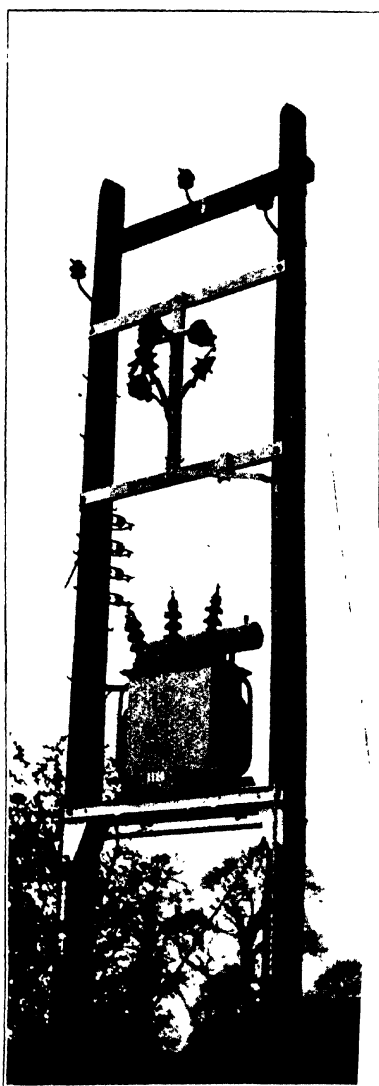


FIG. 1.- "The Grid."



Photos C. A. Cameron Brown.

FIG. 2.- High-tension -low-tension transformer station for farms and villages.

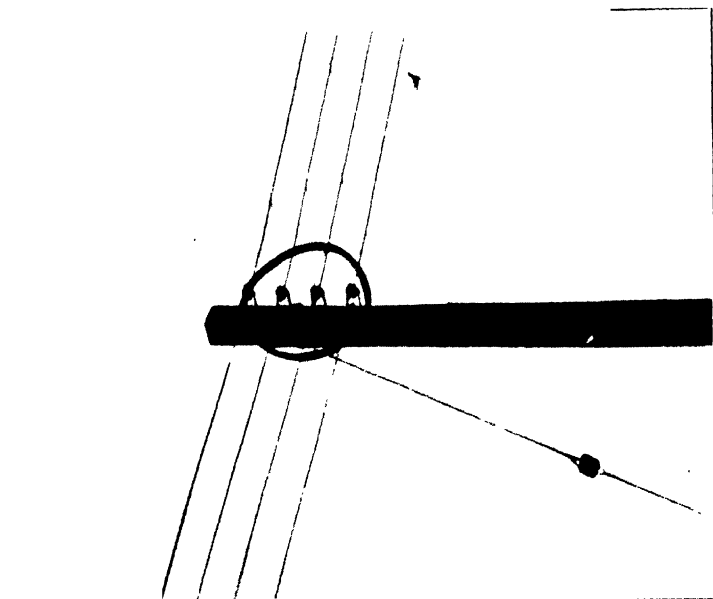


FIG. 3—Four-wire low-tension distribution line.

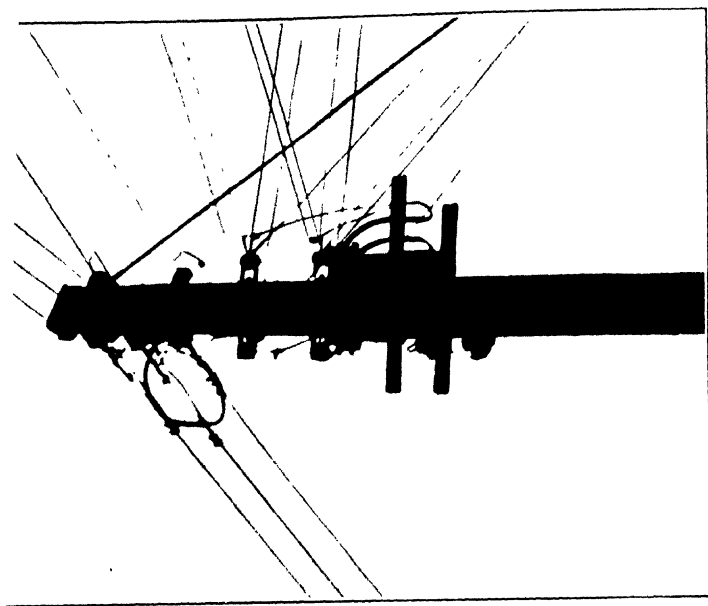


FIG. 4—Single-phase high-tension—low-tension transformer point at isolated farm
Photos C. A. Cameron Brown.

ELECTRICITY SUPPLY AND THE FARMER

from fluctuation in voltage, variable lighting and generally unsatisfactory service. The distribution system is carried out where there is a group of consumers who are reasonably close together, and relies for its economic strength on the fact that the cost of tapping a transmission line to supply a group of consumers is much less than the cost of making individual tappings to each consumer. This is partly because the cost of a 250 kw. transformer, say, is less than ten times the cost of a 25 kw. transformer, and partly because, while ten consumers might each require a 25 kw. transformer to supply them separately, the diversity of their demands for power and light enables them to be supplied, together, with a transformer of less than 250 kw. capacity.

A farmer who is near a low-tension distribution line is usually connected up for nothing, or for only a small charge. Of farmers so situated, most who are willing to be connected are now connected. The two terms are not synonymous, there being instances of farmers with an easily available supply remaining off it. The reasons given have few variants—inability to pay the cost of wiring and electrical equipment, dissatisfaction with the price of current, the “my father did without it” attitude, and—sometimes—an obstructive outlook caused by tactless approach by the supply company, or by some disagreement over wayleaves. Sometimes the difficulty is bound up with uncertainty as to the commitments being entered upon, the electricity that is likely to be used and the resultant bills, the sizes of motors required and their costs.

The necessary information and advice is usually forthcoming from the supply company, but the farmer is not altogether to be blamed if he would prefer to be able to check it for himself. Nevertheless, while 25,000 farms supplied out of a total of 400,000 in the country is far from representing saturation, it may be assumed that something more nearly reaching saturation has been reached in respect of farms situated for supply readily from low-tension systems. The problem with which the supply companies are now faced is the provision of supply to as many as possible of the remaining farms, which are not within easy reach of the low-tension lines. These remaining farms have to be supplied, somehow or other, from the high-tension transmission lines. It is true to say that every farm in the country is within reach of supply by simply throwing out an individual line from the nearest high-tension line, but it is equally true to say that for a large

ELECTRICITY SUPPLY AND THE FARMER

number of farms the cost of that special line would be prohibitive. A line of moderate construction to existing standards would cost £350 to £450 per mile and many farms would require several miles of this.

It might be argued that, on a point of general equity the farmer is entitled to have the cost of his supply line lumped in with the general costs just as in a town the short and long services are, within limits, lumped together. In fact the Dumfriesshire experiment is based on this point, an endeavour being made to carry the supply to any consumer without extra individual charge, and it is an experiment that on this point should be watched with great interest. As things are, however, most supply undertakings do charge part of the cost of making a long service line from a high-tension line to an individual or an isolated group of farms or other premises. There is the growing tendency now to recoup the cost of the line not by a lump payment, which is always a deterrent to making the deal, but by asking a guaranteed substantial revenue at standard rates for a period of years, varying from three to seven. The sum asked is usually of the order of 20 per cent. of the extra outlay incurred in making the connexion. The principle is good and works well in practice, but is only applied where the farmer is a man of some substance and of good business reputation. Sometimes a lump sum payment is required in addition to the guaranteed revenue.

The difficulty that now faces the farmer is to decide whether he can justifiably embark on such a contract to incur such an expenditure for a period of years. He may resign himself philosophically with the reflection that he would anyhow be worse off had he to pay a lump sum. On the other hand, and particularly in certain parts of the country, farmers are not likely to face with equanimity the necessity either for paying out money for current not used or for using current needlessly simply to avoid the former contingency. The difficulty is similar to, but more acute than that facing the farmer on low-tension supply, and by far the most important part is the probable consumption of electricity for justifiable purposes. He must use a certain amount of electricity, and it were better, indeed economically essential, that he should use it where it pays him to do so.

It is possible for a man familiar with the problem to visit any particular farm, and, after inspection and inquiry as to

ELECTRICITY SUPPLY AND THE FARMER

routine and methods, to give a fairly reliable forecast of all the consumptions and costs that are likely to be incurred. Such a forecast could only be given for any individual farm, but it is also possible to present sufficient general information to familiarize farmers with the sort of figures likely to be encountered when they contemplate using electricity, and to enable them to set the limits of their probable costs.

Installation Costs. (1) *Wiring.* Wiring for light is not expensive and the actual cash economy achieved by accepting cheap wiring is not enough to justify the risk and ultimate bad behaviour. The actual cost varies with the nature and lay-out of the buildings, and the disposition and number of lights in them. The farther apart the lights in a given building the higher will be the cost per light. For conditions of adequate but not extravagant lighting, the lighting wiring will cost from 17s. 6d. to 21s. per light. As it is bad practice to plug the flexible cable of portable appliances into a lamp-holder, sufficient proper plug points should be provided; this will cost a shilling or two more than the lighting points. House-wiring will cost roughly the same, but it is unusual to have really first-class wiring done under 21s. per point.

These figures usually include a simple pendant shade which is, nowadays, quite out of place both in farm and farmhouse. Attractive lamp shades for the house cost as little as 1s., but suitable enamelled reflectors for the farm buildings cost upwards of 3s. or so; better use is made of the light by suitable fittings.

Wiring for heating circuits is more expensive, being from 30s. to 40s. per point in the house and probably up to 50s. in the farm if long single runs are likely.

Wiring for built-in motors on the farm is still more expensive, and is again dependent on the distance of the motor from the main supply point. A competent electrician will arrange with the supply company to bring their lines to the point requiring the shortest subsequent runs of heavy wiring. The actual wiring may cost from 40s. for a single-phase $1\frac{1}{2}$ H.P. motor and £3 for a three-phase motor up to 25 ft. from the main switch, depending on the length of wiring required. In considering motor installations, it is usually necessary to provide a concrete bed, but this can often be provided by direct farm labour.

The above figures refer to high-class permanent wiring.

ELECTRICITY SUPPLY AND THE FARMER

Where the buildings are dry and by their nature not likely to last more than 10 or 15 years, effective wiring can be done much more cheaply by using V.I.R. cable run openly on porcelain cleats. In this way lighting can be done at from 10s. to 12s. per point, and small-power points at about the same cost, provided it is possible to supply a local earth.

(2) *Motors and Appliances.* The cost of the electric motor depends on its power, speed, type and make. For any one make and type the higher speed motors are cheapest, but anything over 1,500 r.p.m. is not likely to be suitable for agricultural use except in special cases, and the larger the motor the less is the first cost per horse-power. The three-phase motors are cheaper than single-phase, and this should be kept in mind when deciding—if an option is left—whether the extra first cost of three-phase supply is to be incurred. The squirrel-cage type of three-phase motor is the cheapest motor, but there are technical difficulties connected with supply that cause the supply companies to look on them with an unwelcoming eye. There is usually some power restriction beyond which the squirrel-cage motor may not be used, but it is generally possible to go up to 5 H.P. and often up to $7\frac{1}{2}$ H.P. with a squirrel-cage motor on rural supply lines. The slip-ring type is the alternative for larger motors. Of the single-phase motors the squirrel-cage split-phase type is cheapest, but this is usually only practicable on small sizes, and for anything over 2 H.P. or so, it is usually necessary to instal a motor of the repulsion-induction type, or, more recently available, of the capacitor type, both much more expensive per horse-power. Again, the so-called “protected” type of motor with open ends merely guarded against casual contact with live or moving parts is much cheaper, probably half the price of a motor of the same power but of the totally-enclosed type. In farming there are remarkably few conditions that justify the expense of the totally-enclosed motor, the alternating current motor being of such simple and robust design that the inevitable collection of dust and flour that occurs inside the protected-type motor is immaterial. There are other special types, but on the whole the protected-type motor is suitable for farm use.

There is by no means agreement in price of motors as between one make and another, and a price range of as much as 3 : 1 over different makes has been noted. There is no doubt that the higher priced motor is the better piece of

ELECTRICITY SUPPLY AND THE FARMER

machinery, will have better material throughout, be stronger, and have a better efficiency and a longer life. The farmer can be assured that he will get no less value for money by buying the better-class motor. Knowing, however, how excellent the cheaper motors are, he can be excused if he buys these and thinks rather in terms of his own generation than the next, which is the earliest at which he may expect trouble from the modern first-class motor.

The prices of the popular-size motors in the protected type are roughly as follows:—

r.p.m.	1-phase S.C.		3-phase S.C.		3-phase S.R.	
	1,500	1,000	1,500	1,000	1,500	1,000
$\frac{1}{2}$ h.p.	£ 8	£ 10	£ —	£ —	£ —	£ —
1 "	10	12	—	—	—	—
2 "	13	16	9	11	—	—
3 "	14	18	—	—	18	21
4 "	15	19	—	—	—	—
5 "	18	21	11	14	22	24
7½ "	—	—	14	16	24	27
10 "	—	—	15	18	25	30
15 "	—	—	—	—	30	34

These costs are for motors complete with control gear, slide rail and pulley, and do not cover all types.

Working Costs. The cost of running depends on the cost per unit charged and on the units for work done, the latter being the basis on which to make the forecast of the working consumption.

(a) *Lighting.* The consumption of electricity for lighting is probably more subject to variation due to careless handling or bad lay-out than when used for any other purpose except perhaps heating. It is likely to be greatest on a dairy farm. The consumption on an observed dairy farm of 40 cows with well-lit premises, dairy and office was 104 units for two winter quarters and 18 units for two summer quarters. Another mixed farm with 40 cows, first-class dairy, stables and barn lit, showed a consumption of 313 units during two winter quarters. The lighting consumption on an arable farm is likely to be small unless there are extensive stables. The lighting consumption in the farm house is a very variable

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thing, depending on the personal habits of the family and on its size: where there are young children, ironing, so often included with lighting, is likely to use substantially more electricity than lighting. A fair-sized farm house with six people, would have little difficulty in using 100 units per winter quarter for lighting, ironing, vacuum cleaner and wireless set.

(b) *Cooking and Heating.* The requirements in the way of electricity for cooking and heating are subject to individual habits and method of handling. The figure of 1 unit per person, per day, often quoted for cookery, can only be reached by a cook who has reduced the use of an electric cooker to a fine art; bearing this in mind, it might be safe to reckon on from 1 to $1\frac{1}{2}$ units per person per day. Heating by electricity is equally subject to the method of applying it. To treat the electric fire as if it were a kind of coal fire would pile up the consumption to an incredible amount. Bearing in mind, however, that the electric fire is at its best, economically, for occasional short-period heating, and indeed few rural tariffs permit more than this, good service of this sort should not result in a consumption of more than 2 to 4 units per day; it will generally be during spring and autumn when coal fires have not quite gone out or quite come in, that the use of the electric fire will be found most advantageous. Spreading the average of 2 units per day over, say, half the year, should be sufficient indication.

(c) *Power.* A well-equipped dairy farm is likely to use more electricity in the course of a year than an arable farm, but an all-electric poultry farm can consume an astonishing number of units in the course of the year. The following estimates may afford a reasonable guide:—

Milking machines—30 to 50 units per cow per year. This can be checked roughly, if an engine is used previously, by noting the number of hours daily during which the engine is running. Unless the set is much over-powered each horse-power rating of the engine will mean $\frac{1}{2}$ to $\frac{3}{4}$ units used per hour's running.

Milk cooling—about 3 units per 100 gallons cooled if a two-stage cooler is used: the figure will be approximately doubled if all the milk is cooled without water.

Cold storage—150 to 200 cubic foot store, from 4 to 10 units per day in summer, depending on outside temperatures—say 1,000 units for a six months run from April to September.

Bottle washing—one unit for from 2,500 to 3,000 bottles.

Separating—one unit for from 120 to 170 gallons.

Sterilizing—for a chest of 1 cubic yard about 6 units per operation.

Water-heating by storage heater—one unit for 3 gallons at 160° F.

Water pumping—shallow-wells, springs, etc., from $1\frac{1}{2}$ to 3 units

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per 1,000 gallons: deep wells from 2 to 4 units per 1,000 gallons: all over about $\frac{1}{18}$ unit per 1,000 gallon per foot raised.

Cabinet incubators—all electric—2.5 to 14 units per 100 chicks hatched.

Incubators—electric drive to fan—24 units per day per horse-power of fan motor.

Electric hovers— $\frac{1}{4}$ to $1\frac{1}{4}$ units per chick over 8 week period.

Plucking machines—about 3 units per 100 birds.

Egg washing—1 unit for 24,000 eggs.

Egg grading—1 unit for 25,000 eggs.

Thrashing—Oats—1 to $1\frac{1}{4}$ units per qr.

Barley— $1\frac{1}{4}$ to 2 units per qr.

Wheat—2 to $2\frac{1}{4}$ units per qr.

Grinding—Fine—14 to 18 units per ton.

Coarse—5 to 11 units per ton.

Crushing—5 to 10 units per ton.

Chaff-cutting—6 units per ton.

Cake-breaking—2 units per ton.

Root-pulping—1 unit per ton.

Silage cutting and blowing—beans, peas, etc., 3 units per ton; grass, 7 units per ton.

Mixing machine—Wet—7 to 10 units per ton.

Dry—2 units per ton.

From these figures and from a knowledge of the working conditions, times and quantities on any particular farm, it will be fairly simple to work out approximately the probable consumption of electricity if a change-over to electric power and lighting is contemplated. Where a range of consumptions is given, the higher figure should be adopted if there is much shafting to be driven or where old machines are to be used.

In practically every instance the consumptions are based on observations carried out by the author, who is, however, grateful for the support afforded by the excellent set of miscellaneous figures given by Mr. Martin Harvey in his contribution to the Rothamsted Conference (Report No. XXI). Fuller details of the nature and incidence of many of the farm-power operations in relation to the consumption of electricity are given in a Bulletin, *Electricity in Agriculture*, issued by the Institute for Research in Agricultural Engineering, Oxford.

VERNALIZATION IN AGRICULTURAL PRACTICE

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DURING the last few years much interest has been aroused in agricultural circles by a new method of treating plants to induce earlier maturity, and by the theory of plant development on which the method is based. This theory, that of " vernalization," has been evolved by T. D. Lysenko at Odessa, although the actual method of treatment has been known for many years without having found any direct agricultural application. According to Lysenko's theory, plant growth and plant development are two distinct and separate phenomena, each of which is capable of proceeding independently of the other. Development is supposed to take place in stages, each of which requires a particular combination of environmental factors, which may be different for different stages. Some of these factors are only required for one particular developmental stage and when this is completed can be dispensed with altogether.

Since growth and development are distinct processes it is not always necessary for the chain of developmental changes leading up to flowering and seed production to take place one by one as the plant grows up and as the conditions favouring them occur naturally in the course of the year. If the factors required for the completion of each developmental stage are known and can be provided for the requisite lengths of time, all the stages leading up to reproduction can be effected at any desired time, even in a freshly-germinated seedling, without any growth taking place at all. The seedling can then be planted out and will continue its growth and, since all the developmental stages have been completed, it will proceed also to reproduction without any delay and will rapidly produce seeds independently of the environmental conditions under which it is placed. This is Lysenko's main contention. At least two stages have been detected in the development of the plant. One of the essential factors in the first stage is temperature, winter wheat requiring a low temperature of $+1$ to $+5^{\circ}$ C. for a definite number of days in order to effect the stage. When this is supplied the plant can pass on to the

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second stage, for which one of the obligatory factors is continuous light, or at least a long day, also for a definite length of time. If this is supplied the plant is then in a condition to pass on to the reproductive phase without further recourse either to low temperature or continuous light; in fact a high temperature is preferable since it accelerates the rate of growth and so hastens maturity.

The treatment of the experimental plants is made in accordance with these principles, the plants being subjected to the necessary temperature and other conditions for the requisite length of time to complete the first stage, then to the necessary light conditions, etc., for just such a time as to ensure completion of the second stage, the treatments being applied immediately after the seed has begun to germinate. Every variety has its own special requirements in each developmental stage, which must be determined experimentally before successful treatment can be applied. The technique for all plants is the same in respect of certain essential features, namely, that the seeds must be made to germinate, but without the radicle penetrating the seed coat, and that their further development must be artificially arrested at this stage while the treatment is applied. However, the moisture content, the temperature and the length of treatment vary for each variety. To every 100 lb. of seed of normal moisture content, 37 lb. of water are added for winter wheat. The water must be thoroughly absorbed by the grain, which is then kept for two to three days at a temperature of 5-10° C., for germination to begin, whereupon, when 3-5 per cent. of the seeds have burst their coats, the temperature is reduced to that required by the variety, in the case of winter wheat 0 to +2° C., late spring wheat +3 to +5° C. and early spring wheat +8 to +10° C. The grain is kept at this temperature for the length of time required by the variety, which also differs with different types of crop, winter cereals needing 40-50 days, early spring varieties only 5-6 days, and so on.

When this period is completed the seed is ready for sowing and the main advantage claimed for the method is that since the necessary dose of low temperature has already been received by the young plants before sowing they can be planted out in the field irrespective of temperature conditions; if the light conditions are suitable for effecting the second stage, as they will be in the lengthening daylight of the

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northern spring days when sowings are made in the spring, the plants will go straight ahead to the flowering stage. Indeed, the plants will reach maturity quicker at high temperatures than at low, this fact representing the chief difference between treated and untreated plants, for plants that have not undergone this treatment will fail to come into ear entirely unless sown at such a time that they receive a certain amount of low temperature under 'natural conditions. In special circumstances, such as exist in large areas of the north of Russia, where winter sowing is not possible, this vernalization treatment makes it possible to grow winter varieties by sowing them, after treatment, in the spring, and so permits the growing of desirable varieties of cereals that have so far been quite ruled out for these areas.

Thus, at Hibiny in the Arctic circle, many southern varieties of wheat, and even winter and semi-winter varieties of barley, that normally do not even come into ear there, have been brought to maturity by the application of vernalization. In experiments on the whole world collection of wheats, vernalization accelerated ear development by 2-4 days in the majority of varieties, but in 12 per cent. of the varieties an acceleration of 5-10 days was obtained, and of more than 10 days in 17 per cent. of the varieties tested. Similarly with barley, after vernalization all the 1,505 varieties tested came into ear, whereas without treatment only 665 of these varieties eared, and even these often very irregularly, whereas the rest formed no ears at all. The number of varieties that came to maturity was similarly increased from 15 to 42 per cent., i.e., by three times. The Spanish and Italian barleys came to maturity in 86 per cent. of cases at Hibiny after vernalization, but without treatment only 17 per cent. of them matured.

Again, in the southern wheat-growing areas of the U.S.S.R., such as the Ukrainian Steppes, certain desirable imported wheat varieties are excluded from cultivation because they either fail to ear altogether or else reach maturity too late and are damaged by drought. The earlier maturity induced by vernalization enables some of these varieties to mature before the drought sets in and so escape this damage entirely. In many areas where wheat-growing is precarious the slight acceleration in maturity induced even in the local wheats by vernalization ensures a more certain yield, and vernalization is now practised over thousands of acres of such country in

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the Soviet Union, and its more extensive application is constantly being recommended.

The Soviet workers have thus convinced themselves of the efficacy of vernalization as an agricultural measure to hasten maturity and extend the zones of possible cultivation of a number of varieties of the main temperate cereals. Research on the application of vernalization to herbage and forage plants has not proceeded as far as it has in relation to cereals. Several perennial grasses and legumes have been studied; in these the acceleration in plant development was found to be proportionate to the perennialism of the species. Some evidence was obtained of an after-effect of the treatment in the second year, when an acceleration in flowering was noted, together with more uniform flowering and a measurable increase in forage yield. Similar results are claimed for a number of tropical crops too.

The applicability of these methods to other countries, however, remains a matter of much doubt. Experiments have been carried out in a great number of different countries, and the main observations on the effects of the treatment on cereal plants have been confirmed by all the investigators who have given sufficient attention to the details of the technique. The value of vernalization in making it possible to adjust the time of flowering in genetical work and in providing a method for the rapid multiplication of desirable strains, two or more generations being grown in a year when suitable conditions are applied, is rather generally admitted. It is in the application of vernalization to practical agriculture that doubt remains. Numerous investigators have confirmed the observation that winter cereals sown in spring may never come into ear at all, whereas, after vernalization, they not only come into ear but produce ripe grain. This has been observed in winter rye, barley and wheat in the United States of America, Australia, Holland, Germany and several other European countries, including Britain. At Cambridge, Bell obtained accelerations in earing, varying from nil in some varieties up to 24 days, in certain varieties of winter barley grown in the glasshouse. The maximum difference observed in field sowings amounted to 20 days. The difference between the treated plants and the controls was detectable at an early date, both in the external appearance of the plant and in the development of the ear initials when these were dissected out from their ensheathing leaves. This same observation has

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been made by Purvis, working with rye; together with a number of other investigators, he has found that light and temperature are complementary in affecting reproductive development, in that long days retard development in winter cereals not subjected to vernalization by chilling, but accelerate development if this previous chilling has been effected. Without vernalization many winter varieties sown in spring remained indefinitely in the 'tillering stage and formed no ears at all.

In the experiments of both Bell and Purvis there are indications that the acceleration in earing induced by vernalization is accompanied by a reduction in final number of mature tillers and so probably of yield. Other observers differ in their opinion as to the effect of vernalization upon yield. Regarding rye, Dix of Germany reports that by vernalization the yield of both straw and grain was increased in the two varieties he used, the grain by 14-16 times and the straw $2\frac{1}{2}$ times as compared with unvernallized sowings made at the same time; however, the yields of the vernalized plots were still only one-half those from an autumn sowing. The same has been observed in the United States with wheat, and in hardly any instance has the yield or quality of the crop from vernalized winter cereals sown in spring, compared favourably with sowings of a normal spring variety, whilst the comparison with the results of a winter variety sown normally in autumn is still less favourable. For countries such as our own, therefore, where autumn sowing is usually possible and where even if it fails there are good spring varieties that can be sown in its place, vernalization would seem to be of very doubtful interest. Most of the workers in temperate climates have come to the conclusion that the applicability of the method in agricultural practice is strictly limited. Where it is applicable, however, it may provide a very valuable new agricultural measure, as when winter sowings have failed owing to inclement weather conditions and no suitable spring varieties exist; under such conditions successful vernalization may make it possible for the farmer to give up the precarious winter sowings altogether and resort always to vernalized spring sowings of the same variety. How far this is practicable will be shown only by the results of experiment during the next few years.

Most experimenters are therefore agreed that the main use of vernalization is in borderline cases, where it is just not

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possible or extremely risky to grow a particular variety or crop in a given district. The application of vernalization may then often turn the scales and make cultivation possible and dependable. In many parts of the Soviet Union it is the cereals that represent these borderline crops; in the milder countries, on the other hand, cereal growing is a fairly reliable operation. More precarious, however, is the cultivation of certain important introductions such as the soya bean, and it has been suggested in Germany, for example, that if a successful method of vernalizing this plant could be found, whereby it is induced to mature somewhat earlier, this might make all the difference to the chances of its successful cultivation in many parts of Germany. The same must surely apply in England.

Even more promising would seem to be the application of the principle of vernalization to vegetables and various market-garden crops, where a difference of a day or two in date of maturity may represent a very considerable financial gain or loss to the grower. Many hundreds of pounds are expended annually on other methods of forcing these crops and it would undoubtedly justify the outlay if the possibilities of vernalization in this field were explored. Some experiments have already been made on these lines in other countries. The experiments on cereals at Hibiny and other places within the Arctic circle have shown that the combination of extremely low temperature and continuous daylight peculiar to those regions has a very remarkable effect in increasing the luxuriance of the vegetative development of the plants; common cereals produce such a large mass of green matter that it is recommended that they should be used as green fodder. By a study of the phasic development of spinach and beet it has been possible to grow them successfully also in the Arctic circle.

Beet has been found to require low temperature for its first developmental stage, so that if it is grown out of doors the combination of low temperature and continuous light cause it to run to seed immediately. If, however, the first stage is arrested by growing in a heated greenhouse, bolting is entirely prevented and the continuous light enables a vigorous vegetative development to take place and beets with excellent large leaves and roots are formed.

Spinach on the other hand requires a high temperature to effect the first developmental stage and bolting can be

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prevented either by growing at low temperatures or by curtailing the length of day so that the second stage is not effected.

The importance of these facts from our point of view lies not in the possibility of growing vegetables in the Arctic circle, a matter in which few of us are directly interested, but in the insight they give us into the developmental processes of the plants in question. Possessed of this knowledge of their developmental cycle and of the conditions required to regulate it, the grower in this country ought to be able to apply the principles to his own particular conditions, and thereby extend the growing season of these vegetables in the direction of earlier or later croppings or even be able to grow them "out of season." The same will apply to other vegetables when the necessary information on their developmental cycles is forthcoming. Experiments on lettuce have been made already in Germany. Spring varieties have been found to be uninfluenced by length of day, whereas most other varieties were favoured by a short daily period of illumination in that when grown under short-day conditions, bolting was altogether prevented, and they developed a greater quantity of green matter. It is, therefore, concluded that the young plants should be grown under a reduced length of daily illumination whereby the length of time during which they are of market value is extended. Similarly, by growing the young seedlings for ten days at -5°C . a marked increase in the fresh weight and marketing value of the plants was obtained.

There is very little doubt, therefore, that if the method of vernalization is to be of any use in this country it will be in the realm of market gardening for forcing early or out-of-season vegetables, salad plants and possibly fruits. It may also provide a method of producing seeds from herbage plants in the sowing year, particularly from the bred "pasture" types which normally produce a reduced number of flowering heads. Its application to these plants and to many biennials such as sugar-beet, the Brassicas, lettuce and others, should be of interest to seed merchants.

It is important to remember that the treatment differs very widely for different plants. Even different varieties within a species may have quite different requirements as regards treatment, and still greater differences are to be observed between different crops. It is not enough, therefore, when testing a new plant, to apply a form of treatment recommended

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for another plant and expect it to work. With any new crop, and even a new variety, it is essential to determine its specific requirements as regards its several developmental stages before working out a technique for its treatment. A large field of possibilities is open to horticulturists who are willing to apply these preliminary experiments to a wide range of commercial crops in this country and find out which of them, if any, respond to some form of vernalization treatment and what are the precise conditions required by each to produce the maximum and desired effects. There are very few plants for which this is adequately known, and none of them is a plant that is likely to respond in this country to vernalization, and until the necessary experiments have been carried out on the most likely plants it is quite impossible to assess the possibilities of vernalization as a practical method for British agriculture.

[A more complete and technical consideration of this subject will be found in Vernalization and Phasic Development of Plants, being Bulletin No. 17 of the Imperial Bureau of Plant Genetics. Copies, price 10s. can be obtained from either of the two Branches of the Bureau, Agricultural Buildings, Aberystwyth (Herbage Plants) or the School of Agriculture, Cambridge (Crops other than Herbage).]

THE KENT PIG RECORDING SOCIETY

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THE importance and value of pig recording is now universally recognized alike by research workers, agricultural education authorities and enlightened pig breeders who have studied the problem of improving pig production in this country. Attention has been drawn to it continually in the agricultural press, and Mr. J. W. Reid's article in the November, 1935, issue of this JOURNAL was a valuable contribution to the subject. The practical difficulty has been to evolve a scheme of pig recording that could be cheaply and at the same time efficiently carried out and administered. After three years' experience the Kent Pig Recording Society believes that it has found a solution to that difficulty.

The Kent Pig Recording Society was started as the result of the following resolution, passed at a meeting of the Canterbury Farmers' Club on October 15, 1932, and submitted to the Kent Milk Recording Society:—

"That this Club requests the Kent Milk Recording Society to give the question of pig recording their consideration and to consider whether they would be able and willing to provide facilities for pig recording in the County."

When the Executive Committee of the Milk Recording Society had this resolution under review, they received an offer of a grant of £10 from the Kent Education Committee towards the cost of the initial equipment (i.e., ear nippers and a weighing Balance for each Recorder, etc.) if the Society would allow its Staff (Secretary and Milk Recorders) to carry out the duties associated with pig recording.

The Milk Recording Society favourably considered the proposal and co-operated with the Kent Education Committee in calling an open meeting of pig breeders at which the proposal to form a Pig Recording Society could be discussed. This meeting was held at the Corn Exchange, Maidstone, on January 26, 1933, and was addressed by the County Agricultural Organizer, who explained the proposals and the advantages to be derived from pig recording. The Secretary

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of the Milk Recording Society offered his services as Hon. Secretary if a Pig Recording Society should be formed and reported that all of his milk recorders were willing to carry out the weighing duties on a fee basis. The Advisory Economist at the South-Eastern Agricultural College, Wye, offered to co-operate with any of the members of the Society who would like his assistance in organizing a food recording scheme to be worked in conjunction with pig recording. The meeting unanimously decided in favour of forming a Pig Recording Society and appointed a Committee to frame the rules. This Committee quickly completed its task and the milk recorders started weighing litters of pigs on April 29, 1933.

The actual cost of the initial equipment and of sufficient stationery for two years was as follows:—

	£	s.	d.
Six weighing balances, weighing up to 60 lb.	4	10	0
Six pairs ear nippers	2	5	0
Stationery—books, forms, etc.	9	5	0
	<hr/>		
TOTAL	£16	0	0

The Executive Committee includes two representatives (both pig breeders) appointed by the Milk Recording Society to safeguard the interests of that Society, two representatives appointed by the National Farmers' Union, and ten practical pig breeders appointed by the Members of the Pig Recording Society. The County Agricultural Organizer is an ex-officio member of the Executive Committee. It may be mentioned here that the Pig Recording Society is run quite apart from the Milk Recording Society, though the two societies have the same staff.

The milk recorders act as part-time pig recorders in addition to carrying out their milk-recording duties, and are paid by the Pig Recording Society 2s. for every litter of pigs weighed. This fee includes their travelling expenses as well as the actual time and labour involved in weighing the pigs, and they are glad to earn this extra remuneration. There are five milk recorders employed by the Milk Recording Society and they all volunteered to act as part-time pig recorders. Each covers an area of the county with a radius of approximately 12 miles from his headquarters. It has been found that the average amount of time spent at each farm for pig recording purposes is about 45 minutes per visit, exclusive of travelling time. On an average the recorder will weigh about two litters per visit.

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Notification of the birth of a litter of pigs is given to the Secretary of the Society by the member filling in the blanks on a printed postcard, within 10 days of the birth of the litter. The Secretary informs the recorder and the recorder notifies the member by means of a postcard of the date and time of his intended visit to weigh the litter.

Members of the Society pay an annual subscription to the Society varying with the size of their herd as follows:—

				<i>s.</i>	<i>d.</i>
For herds of 5 sows or less	..	..	..	5	0
For herds of 6 to 10 sows	..	..	..	7	6
For herds of more than 10 sows	..	..	..	10	0

Members pay a fee of 2*s.* 6*d.* for each litter of pigs weighed. The pig recorder carries with him a pair of ear nippers and marks the pigs—a service for which no extra charge is made—if they are not already marked by the breeder with a Breed Society's mark or a private number. The rules of the Society require that every sow in a member's herd must be recorded and any breed or cross is eligible for recording. The litters are weighed by the recorder at 6 weeks old. This age was decided upon, after considerable discussion, in preference to either 3 weeks old or 8 weeks old, for several reasons. The Committee were of opinion that weights at 3 weeks old were often misleading because many pigs suffer from scour at about that time and the weights would not, under those circumstances, be a true index of the sow's milking qualities. They were of opinion that weights at 8 weeks old also failed to be a true indication of the sow's mothering qualities because many pigs have received an appreciable amount of food at that age in addition to the milk they have obtained from the mother. At 6 weeks old, on the other hand, the pigs have not had the opportunity of consuming much meal and the age is convenient for weighing because the boar pigs are in any case being handled at that age for castration. At the same time as the recorder records the weight of each individual pig he takes particulars of the number of pigs that were born alive and dead, the number that have died since birth and the cause of the deaths, if known.

It is not always practicable for the recorder to weigh the litters at exactly 6 weeks old, and he is allowed a margin of 3 days each way, i.e., he can weigh at any time between 39 and 45 days old. He has a calculating table by which he can correct the weight to the 42nd day. Every member is

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provided with a weighing bag which he obtains from the Secretary at cost price, 2s. The bag is available for the recorder's use whenever he calls at the farm, and in this way the risk of carrying disease from one farm to another is reduced.

Every pig is marked and weighed individually. Pedigree earmarks are always accepted. If they are not already suitably earmarked, white-eared pigs are tattooed and black-eared pigs are marked by snips in the ears. A code set of marks is used for snipping. All pigs in the same litter are given the same number as the sow unless they are pedigree pigs, when the numbers are consecutive. The recorders are all accustomed to ear-marking in connexion with their milk recording duties and consequently the marking creates no difficulties.

The recorder, having collected all the data relating to the date of farrowing, the number, name, pedigree and breed of the dam and sire, the number and sexes of the pigs born alive and dead, the number and cause of casualties up to 6 weeks old, the individual weights and sexes of the pigs still alive and the weight of the whole litter, submits his report to the Secretary of the Society who enters up all the data in his book. The recorder also leaves a copy of the report with the member. Information is thus obtained from each herd as to:—

- (a) the number of pigs born per litter ;
- (b) the number and weight of each pig at 6 weeks old ;
- (c) the number and cause of casualties ;
- (d) the frequency of each sow's litters.

A Certificate of Merit is issued in respect of sows that attain a specified standard of performance as follows:—

- (1) Not less than 24 pigs have been weaned in any 3 litters within 16 months from any date of farrowing.
- (2) The average weight per pig in each of these litters is not less than 21 lb. or the weight of any litter is not less than 190 lb. at 42 days old.

(NOTE.—Where a gilt's first litter is included, the number of pigs weaned in that litter must be not less than 7. No pig weighing less than 15 lb. at 42 days of age, counts toward a Certificate.)

During the $3\frac{1}{4}$ years ending June 30, 1936, 1,633 litters, the progeny of 649 different sows, have been weighed. There are 261 sows that have had three or more litters weighed and 45 of them, i.e., 17 per cent., have won Certificates of Merit. Two sows, a Wessex Saddleback and a Large Black, have also won Double Certificates of Merit by producing six litters in

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twice the time allowed for an ordinary Certificate. The Wessex sow farrowed and reared six litters of pigs up to 6 weeks old in 128 weeks; she reared 53 pigs averaging 247.42 lb. per litter or 28.02 lb. apiece at 6 weeks old. The Large Black sow farrowed and reared six litters of pigs in 134 weeks; she reared 63 pigs averaging 260.29 lb. per litter or 24.79 lb. apiece at 6 weeks old.

The Society's regulations also include a scheme for measuring the progeny of recorded sows by recording:—

(a) The age for weight.

(b) The carcass quality where pigs go to a bacon factory.

It was laid down that a fee of 2s. 6d. per litter would be charged and it was intended that a representative of the Society should check the live-weight, the carcass-weight and the carcass-quality at the time of slaughter, but very few members possess the necessary facilities for weighing bacon-size pigs, as these weighing machines are too expensive for most members. Financial difficulties have so far made this part of the scheme impracticable, but members have been able, where they have got weighing facilities, to record the weights for age privately, and they can get information as to the carcass weight and quality from the factory.

As regards pigs, bred by members of the Society, that are sold as stores in the auction markets, the auctioneers are generally willing, when asked, to provide the breeder with the name and address of the purchaser of the pigs. These pigs are readily identified by the ear marks, so that it is a simple matter for the breeder, by keeping in touch with the purchaser, to follow his pigs through to the end.

The Society held its first sale of recorded pigs at Ashford on November 15, 1934. There were 110 recorded pigs included in the sale. It was somewhat in the nature of an experiment and all the pigs were not sold, but the sale realized £657 and all the expenses were met. For a first attempt the result was considered to be satisfactory, but it was not found possible to get sufficient entries from members to enable another sale to be held this year. This is accounted for to some extent by the good demand during the past year for recorded pigs, which members have been able to sell privately without any deduction for commission or sale expenses. Arrangements have been made to hold a sale in the spring of 1937, and more than 200 entries have already been promised.

THE KENT PIG RECORDING SOCIETY

At the County Agricultural Show in 1935 and 1936 the Society organized a class open to any ear-marked recorded sow, owned by a member of the Society, which had farrowed two litters during the year ended April 1, and had been recorded by the Society. Points were awarded for both inspection (max. 100 points) and records (max. 100 points), the total points being taken into account in making the final placings. Prizes of £5, £3 and £2 were given for this class by the County Agricultural Society, and it attracted eleven entries in the two years.

A Herds Records Competition has been held annually since the Society first started, for the best records of the average number of pigs reared per litter and the average weight of the litters at 6 weeks old. The competition is divided into two classes, one for large herds and one for small herds. Prize money amounting altogether to £10 plus £3 3s. *od.* to the stockmen, has been given each year by a well-known commercial firm.

Last year, the Society also instituted a Herds Competition that proved of great interest. Points were awarded for inspection, records, general management, boar, etc., the scale being as follows:—

- (1) On the average number of pigs reared per litter to 6 weeks old :
in such average for each pig, from sows 30 points were awarded, from gilts 33 points.
- (2) On the average weight of the pigs reared to 6 weeks old : for each 1 lb. average, 15 points were awarded.
- (3) For regularity of breeding, i.e., the number of litters reared in the year in relation to the number of sows in the herd :
maximum 200 points.
- (4) Inspection points : maximum 500 points.
- (5) Boar points : maximum 250 points.
- (6) General management : maximum 100 points.
- (7) Home-breeding points : 3 points were awarded for each 1 per cent. of the herd that has been bred by the competitor :
maximum 150 points.
- (8) Equalizing points : 2 points were awarded for each sow in the herd : maximum 80.

There were nine entries. A Challenge Cup was provided by the then President of the Society.

The publisher of the Milk Recording Society's Year Book has helped the Society by allotting additional space in the Year Book for the publication of the annual results and other information of interest connected with the Pig Recording Society.

The Kent Pig Recording Society has been in existence for

THE KENT PIG RECORDING SOCIETY

3½ years and has now (July 1936) 36 members recording approximately 300 sows. The results up to June 30, 1936, may be summarized as follows:—

Total number of litters weighed	..	..	..	1,633
Total number of pigs born alive	..	..	..	16,284
Total number of pigs born dead	..	..	..	1,977
*Total number of pigs died before 6 weeks old	..	..	..	2,817
Total number of pigs weighed	..	..	..	13,467
Average number of pigs born alive per litter	..	..	..	9.97
Average number of pigs born dead per litter	..	..	..	1.21
Average number of pigs alive at 6 weeks	..	..	..	8.25
Average total weight of litter at 6 weeks	..	..	..	167.16 lb.
Average weight of each pig at 6 weeks	..	..	..	20.27 lb.

*Analysis of casualties:—

Laid on by sow	..	..	..	1,831
Killed off as too many to rear	..	..	..	334
Killed off as weakly	..	..	..	326
Died through illness	..	..	..	229
Died as result of accidents	..	..	..	97

2,817

The average figures are of general interest. The figures that are of most value to members of the Society are those for each individual herd. These are published under Code Numbers and show each member how the results of his breeding and management compare with those obtained by other members of the Society. His own records show him the performances of each of his sows, and he has data that are invaluable to him in deciding which pigs to retain for breeding purposes and which to discard.

The work of the Pig Recording Society has benefited others besides the actual members of the Society, for there is evidence that quite a number of pig breeders who are not members of the Society are recording their results privately and comparing them with the data published by the Society.

Three years' experience has shown that the system of "marrying" pig recording with milk recording has worked perfectly smoothly and satisfactorily in practice. There has been no cleavage of interests or friction between the Milk Recording Society and the Pig Recording Society. The milk recorders have welcomed the opportunity of earning extra money by carrying out the spare-time duties of pig recording, and their milk recording work has not suffered. One of them, who has 29 milk producers allotted to him for milk recording, has been able, in addition, to weigh as many as 223 litters of pigs in a year for members of the Pig Recording Society without difficulty. Milk recorders have most of their morn-

THE KENT PIG RECORDING SOCIETY

ings free and are, therefore, able to weigh litters during this time, and they often find it convenient to weigh a litter of pigs on their way to or from a visit to a milking herd.

With this combination of milk recording and pig recording by the same official, travelling expenses have been halved, and there has been a considerable saving in salaries. The recorders have been able to do valuable propaganda work in bringing the advantages of milk recording to the notice of pig-recording members and the advantages of pig recording to the notice of milk-recording members. In Kent there are at the present time 154 herds in the Milk Recording Society and 34 herds in the Pig Recording Society. Ten of the members of the Milk Recording Society are also members of the Pig Recording Society. There are five full-time recorders employed by the Milk Recording Society and they are all devoting their spare time to pig recording.

The only serious difficulty that has been experienced by the Pig Recording Society has been one of finance. There has been no balance available at the end of each year to pay an adequate remuneration to the Secretary. The income and expenditure account for each year may be summarized as follows:—

INCOME.

EXPENDITURE.

Eight months ended December 31, 1933.

Thirty-one Members, 28 of whom had litters weighed.

	£	s.	d.		£	s.	d.
Donations	15	11	0	Payments to recorders	31	18	0
Annual subscriptions ..	15	0	0	Postages, printing and stationery	18	8	10
Weighing fees	39	17	6	Honorarium to Secretary	10	0	0
				Sundries	4	13	0
				Profit on year	5	8	8
	<hr/>				<hr/>		
	£70	8	6		£70	8	6
	<hr/>				<hr/>		

Year ended December 31, 1934.

Thirty-three Members, 31 of whom had litters weighed.

	£	s.	d.		£	s.	d.
Donations	11	0	0	Payments to recorders ..	53	16	0
Annual subscriptions ..	16	10	0	Postages, printing and stationery	12	12	8
Weighing fees	67	5	0	Honorarium to Secretary	25	0	0
Profit on recorded sale	2	4	3	Sundries	4	8	9
				Profit on year	1	1	10
	<hr/>				<hr/>		
	£96	19	3		£96	19	3
	<hr/>				<hr/>		

THE KENT PIG RECORDING SOCIETY

Year ended December 31, 1935

Thirty-one Members, all of whom recorded.

	£	s.	d.		£	s.	d.
Donations	15	0	0	Payments to recorders	47	16	0
Annual subscriptions ..	16	8	0	Postages, printing and stationery	14	8	1
Weighing fees	59	15	0	Bad debt	6	0	3
				Honorary to Secretary	20	0	0
				Sundries	1	16	5
				Profit on year	1	2	3
	£91	3	0		£91	3	0

The number of litters weighed in each year has been as follows:—

8 months ended December 31, 1933	312
12 " " " 1934	538
12 " " " 1935	478
6 " " " June 30, 1936	305
	<u>1,633</u>

There is every likelihood of the total number of litters weighed in 1936 being greatly in excess of any previous year.

The reduction in the number of litters weighed in 1935 can be accounted for by outbreaks of swine fever in two of the largest recorded herds, as a result of which the visits of the recorder had to be suspended. It is estimated that an additional 120 litters would have been weighed if it had not been for this misfortune.

The expenditure during the last two complete years has worked out at an average of £3 per herd and 3s. 8d. per litter recorded. Fifty-five per cent. of this expenditure is in respect of salaries of recorders. The Society is self-supporting except that adequate provision is not made for the administrative work involved in its management. It is too much to ask Secretaries of County Milk Recording Societies to do this work for a small and uncertain honorarium, and, if pig recording is to develop, account will have to be taken of this financial difficulty.

FACTORS AFFECTING THE EFFICIENCY OF STEAM STERILIZERS:

Report on a Series of Tests carried out on Various Types of
Sterilizing Outfits.

*Compiled by Members of the Agricultural Organizer's Staff,
Hampshire County Council, the Institute for Research in
Agricultural Engineering, Oxford, and the National Institute
for Research in Dairying, Shinfield, Nr. Reading.*

Introduction. It is now generally conceded that the utmost cleanliness of all the utensils is necessary for the production of milk that will conform consistently to a given satisfactory bacteriological standard. In practice this means that the utensils must, after thorough washing, be regularly sterilized, and for this purpose, nothing so far has been found to be superior to steam. With the advent of the Accredited Scheme a large number of types of steam sterilizer have been put on the market, and as no satisfactory criterion exists, the farmer may well feel some embarrassment when making his choice. The type of outfit that is suitable must vary greatly with circumstances, and it is the purpose of this article to present the results of practical tests for the guidance of the buyer.

On the initiative of the Hampshire Agricultural Instruction Committee, and with the concurrence of the manufacturers, tests were carried out by a group of investigators consisting of members of the Hampshire County Staff, the Institute for Research in Agricultural Engineering, Oxford, and the National Institute for Research in Dairying, Shinfield, Nr. Reading. The earlier tests took place at the Hampshire Farm Institute, and the later tests at the National Institute for Research in Dairying.

The purpose for which a sterilizing outfit is designed is to sterilize milk utensils (which have been previously thoroughly washed and rinsed) and, in most cases, to supply a quantity of hot water. It has been proved earlier, that if a temperature of not less than 210° F. is maintained for at least 10 minutes, there will not only be heat penetration to all parts of a sterilizer loaded with utensils, but there will be a sufficient working margin of safety under practical conditions to ensure that effective sterilization is obtained. In view of the known effectiveness of this combination of time and temperature it was considered unnecessary to carry out bacteriological tests

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for sterility and, therefore, the tests could be safely confined to the following scheme.

Scheme of Tests. Tests were carried out to provide information on the following points:—

1. Operating times and evaporation rates.
2. Fuel consumption and cost of running.
3. Construction and general suitability.
4. Boiler efficiency.

Every endeavour was made to approximate to farm practice, and each outfit was therefore tested over a period of three consecutive days, two steamings per day being made. A standard weight, per cubic foot of sterilizer space, of bottles in crates was put into the chests, which were then brought up to 210° F. and maintained for a period of at least one hour, for the purpose of obtaining the evaporation rates. The fuel consumptions given in the table are calculated for the period required to raise the steam chest to 210° F. and maintain it at that temperature for 10 minutes. The tests were carried out in a building typical of those found on the average farm. For purposes of comparison the outfits were divided into the following classes:—

Coal fired.

Class A.—All outfits having a chest capacity of 20 cubic feet or less.

Class B.—All outfits having a chest capacity of more than 20 cubic feet.

Oil fired.

Class C.—Outfits of both high- and low-pressure types.

Electrically-heated outfits.

Class D.

The provision of a quantity of hot water was considered a necessary duty of each coal- and oil-fired outfit. In one electrically-heated outfit (Class D.3) this has been considered a separate duty and should be taken into account when comparisons are made. For test purposes, outfits of 20 cubic-feet capacity or below, were required to supply 5 gal. of water at 180° F., and outfits above 20 cubic feet, 10 gal. of water at 180° F. Steam coal, of a quality in common use on farms, was used on all outfits designed to burn solid fuel.

For purposes of calculating running costs, coal has been priced at 40s. per ton, and given a calorific value of 13,000 British Thermal Units per lb., paraffin priced at 10d. per gal., and given a calorific value of 20,000 British Thermal Units per lb., and electricity valued at 1d. per unit.

The table gives a summary of the results secured from trials of 13 different sterilizers (8 coal-fired, 2 oil-fired and

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3 electrically heated), and also information to enable comparisons to be made.

Method of Allocating Marks for Construction and Suitability. Marks for construction and suitability were assessed by consideration of various factors, including the quality of the material used, the method of construction, ability to attain a standard of sterilization, and the attention required during operation. Marks were awarded on a percentage basis, the best outfits in the respective classes being given marks to a total of 100. Where outfits failed to attain a standard of sterilization or were considered to be impracticable in use no marks have been awarded.

Consideration of Tests. It will be seen from the table of summarized results that there is wide variation from outfit to outfit and from class to class in performance and efficiency. It may be profitable to discuss the classes separately.

Coal-fired Outfits—Class A. It will be convenient to consider outfit A.1. In this case sterilization was effected from cold in 59 minutes, the fuel consumption was very reasonable, the weight of steam generated per lb. of fuel good, the boiler capacity in proportion to chest capacity high, and the efficiency of the boiler, in its class, above the average.* These favourable features were combined with a favourable cost of running, but on assessing the construction and general suitability, it was found that it scored fewer marks than any other outfit to which marks were awarded, and its apparent lack of wearing qualities, resulting in heavy depreciation, would require serious consideration. In addition, the first cost, in proportion to chest capacity and quality of construction, was high. Outfit A.4 was very slow in steam raising, and on occasions failed to reach an efficient standard of sterilization. This appeared to be due to small boiler capacity in proportion to chest capacity, which in practice would make the outfit very difficult to use. Outfit A.5 was of

* It should be noted that dairies in which the sterilizing, homogenizing or pasteurizing of milk are carried out are regarded as coming under the provisions of the Factory and Workshop Act, 1901, which requires that every steam boiler installed on such premises shall be thoroughly examined by a competent person at least once in every 14 months. Farmers, therefore, are strongly advised to follow the now almost universal practice of factory occupiers, viz., to insure their steam boilers with a reputable boiler insurance company which employs trained inspectors to make the necessary thorough examinations and to furnish reports. It is essential for the safe working of a steam boiler that it shall at all times be in the charge of a trained, intelligent workman.

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very excellent construction and the cost of running reasonable, when compared with the capacity of the chest. The initial cost of this outfit, however, was very high in comparison with others.

Coal-fired Outfits—Class B. Similar variations occur in the Class B outfits. It is seen, for example, that the outfit B.2, which is most economical in fuel consumption, gained very low marks for construction and suitability, and on this account would probably not be economical in the long run.

Oil-fired Outfits—Class C. Only two oil-fired sterilizers were tested, but their values to the farmer were very different. Outfit C.1 was of the two-unit type, i.e., separate boiler and chest, and was fired by four primus-type blow lamps. Its overall performance (particularly the operating time) was excellent, but good results could only be obtained by very frequent attention to the water feed, burners, and oil-reservoir air supply. Further, it was necessary to maintain all burner parts in a good state of cleanliness, necessitating attention when the outfit was not in use. On many farms, therefore, the outfit may be impractical. Outfit C.2 was of the one-unit type, steam being generated within the chest by four burners of the wickless type. Its overall performance and running costs were excellent when compared with others. The fuel and water supplies were automatically controlled and required little or no attention during operation.

Electrically-heated Outfits—Class D. As with the other types, the time and cost of running varied considerably, but it must be remembered that no attention other than switching the current on and off is necessary. All outfits in this class were of the one-unit type. Outfits D.1 and D.2 were designed to supply hot water; this feature accounted for the long operating time and very high running costs. Outfit D.3 was designed for steam sterilization only, and effected sterilization in a much shorter time, with reasonable running costs. In all these outfits the operation of sterilizing, apart from loading and unloading of utensils, requires no labour or attention—an advantage of considerable value. From a consideration of the whole of the available data the following facts emerge:—

Consideration of Data: (a) *Coal Consumption.* In the coal-fired group there was considerable variation from one outfit to another in the quantity of fuel used per sterilization from cold.

EFFICIENCY OF STEAM STERILIZERS

|| Not possible to compute, as water is condensed and returned to boiler to be used again.

EFFICIENCY OF STEAM STERILIZERS

The largest quantity was used in the low-pressure, two-unit type of outfit. In this type there is only a small difference (3° F. to 8° F.) between the temperature of the steam generated and the required temperature in the steam chest. This small margin leaves little room for heat losses in transmission and radiation, and necessitates frequent stoking.

(b) *Insulation.* No really comparable basis for the estimation of the value of insulation was possible, but the estimated running costs of Outfit B.2 indicate that insulation is valuable. It is considered that the use of insulation on the low-pressure two-unit type of outfit would be very desirable and advantageous.

(c) *Stoking.* The number of times a boiler has to be stoked during a run is a serious consideration. In Class A and B, less frequent stoking is required with the high-pressure types. The steaming capacity of the boiler in proportion to the cubic capacity of the steam chest (see col. 9) must be ample, otherwise excessive attention is necessary, and moreover, steam can be maintained only by the use of the best quality fuel. In comparing column 9 for A and B Class outfits it must be borne in mind that although the figures for the latter class appear small, in reality, owing to the greater heat value of the high-pressure steam, they compare favourably with the former. The fitting of damping arrangements was common to all high-pressure types, and proved a very desirable feature in that the firing rate could be controlled and the boilers banked down in readiness for steaming.

(d) *One-Unit Outfits.* Outfits C.2, D.1, D.2 and D.3 are operated by steam generated within the steaming chest. This design has the advantages that no transmission losses occur, that water consumption is reduced to a minimum and that the outfit is more readily moveable. It is noticeable that the C.2, and D.2 and D.3, which are insulated, are more efficient than D.1, which is not insulated. In outfit C.2 the cylindrical shape of the steam chest, assembled in a horizontal plane, almost eliminated the objectionable feature of condensate drips.

(e) *General.* The time necessary to complete sterilization from cold is very variable in all four classes. In practice a reasonably short time should be aimed at, but this should be considered in relation to individual circumstances. In classes

EFFICIENCY OF STEAM STERILIZERS

A and B and outfit C.1, operating time means attention, but where water and fuel supplies are automatically controlled, as in outfits C.2, D.1, D.2 and D.3, time is perhaps not of such importance.

In the case of electrically-heated outfits D.1 and D.2 the design is such that the provision of hot water incurs prohibitive running costs. This may be overcome to some extent by the installation of a separate unit for hot-water supply. The cost of current is one of the main considerations and is based on 1d. per unit. This figure varies in different localities, but the basic rate may be reduced by operating during periods of "off peak loads" by means of control time switches.

The great variation in performance and general suitability of various types of apparatus (all designed for the same purpose) revealed by the tests described in this paper, emphasize the necessity for reliable information for the guidance of the purchaser. It may be pointed out that with sterilizers, as with many other types of dairy apparatus, such information is contained in the certificates granted to manufacturers after thorough practical trials have been made under the auspices of the Machinery Testing Committee of the Ministry of Agriculture. After testing by this Committee, apparatus that has received a certificate under seal of the Ministry of Agriculture may be bought with confidence as capable of fulfilling the claims made for it. From the responsible manufacturer's standpoint also, it is not infrequent that from such trials is gained information that may assist him to meet more adequately the actual requirements of the farmer.

Brief Specification of Outfits

In all instances Class A and B outfits consisted of two independent units (two-unit type), (a) vertical boiler, (b) steam chest, the two units being connected by steam pipes.

Class A Boilers.—Boilers A.2 to A.4 consisted of a cylindrical welded shell, with central flue uptake, fitted with gauge glass, weighted-loaded safety valve, steam-supply tap, and filling pipe and tap. A cylindrical manhole was provided to facilitate internal cleaning. Steaming pressure was approximately 1 to 2 lb. per sq. in. For purposes of providing hot water a draw-off cock was fitted in the side.

Boilers A.1 and A.5 were designed to steam at 30 lb. and 25 lb. respectively. A.1 consisted of two welded tubes concentrically assembled, the inner tube constituting the fire box and flue uptake, fuel being fed in at the top; a draught damper was fitted to the ashpan and the boiler shell insulated. A.5 consisted of a riveted shell boiler, with a removable top for internal cleaning, and was fitted with fire baffle and side outlet flue. Draught control was effected by ashpan damper. In both designs

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a water feed tank was provided, together with a hand force-pump for purposes of feeding water, spring or weight-loaded safety valve, pressure gauge, steam-supply cock, and blow-down cock.

Class B Boilers.—Three types of pressure boilers were used in this class:—

1. Vertical smoke tube type with central or side flue.
2. Vertical central flue uptake of large dimensions, the central flue actually constituting the fire box.
3. Vertical cylindrical type having no tubes, with fire baffle in grate, and bottom side outlet for the flue.

In all instances the boilers were fitted with gauge glass, spring- or weight-loaded safety valve, pressure gauge, steam-supply cock, blow-down cock, and hand operated force-feed pump.

Where pressure boilers were used, the method of obtaining hot water was to take a steam supply from the steam delivery pipe, and blow live steam, through a steam nozzle, into 10 gal. of water.

Steam Chests—Classes A and B.—The steam chests consisted of square or rectangular galvanized plate structures, mounted on stands of various heights. The chests had hinged, sliding, or take-off doors, fitted with screw or cam action clamps to retain the doors in position on a seating, making a steam-tight joint. Chests that were insulated are indicated in the table.

Class C Outfits.—Outfit C.1 was of the two-unit type, having a vertical cross-tube boiler, fitted with a superheater coil in a central flue. Steaming pressure was 25–30 lb. per sq. in. Four burners of the primus type, fitted with vaporizing tray and oil reservoir, constituted the burner system. The boiler was fitted with gauge glass, spring-loaded safety valve, pressure gauge, steam-supply cock, blow-down cock, and hand force-feed pump. The chest was of the same specification as Class A and Class B outfits.

Outfit C.2 was of the one-unit type. The boiler consisted of a flat corrugated tray let into the base of the steaming chest. A water reservoir supplied a constant feed to the boiler tray by an automatic-level device operating on the air-lock principle. The steam chest was of cylindrical construction, mounted in a horizontal plane, insulated for approximately three-quarters of the circumference. Four oil burners of the wickless type, fitted with oil reservoir and flame adjusting gear, constituted the burner system. A draw-off cock was fitted to the boiler tray for purposes of providing hot water. Steaming pressure was practically atmospheric.

Class D Outfits.—All outfits in this class were of the one-unit type. Types D.1 and D.2 consisted of steam chests with boiler tanks let into the bottom of the chest. In each the capacity of the boiler tank was such that 10 and 5 gal. of water respectively could be drawn off previous to steaming. The heating elements consisted of two immersion heaters with separate switch control in type D.2, and one immersion heater in type D.1. Outfit D.3 consisted of a steaming chest with a tubular boiler of special design attached to the side and fitted with a ball valve control for automatic water feed. Two heating elements with change-over link-connexions for different electrical loadings were fitted in the boiler tubes.

An automatic time switch, on and off, was fitted. No provision was made for the supply of hot water. The steaming chests of outfits D.1 and D.3 were of the same specification as Class A and Class B outfits. The steaming chest of outfit D.2 was of cylindrical design mounted vertically. In all instances the steaming pressure was practically atmospheric.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1936

ACREAGE UNDER CROPS AND GRASS AND NUMBERS OF LIVE STOCK ON HOLDINGS ABOVE ONE ACRE IN EXTENT IN ENGLAND AND WALES AS RETURNED BY OCCUPIERS ON JUNE 4, 1936.

(The figures for 1936 are subject to revision.)

Crops and Grass

Distribution	1936	1935	Increase		Decrease	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
TOTAL ACREAGE under all CROPS and GRASS	24,858,000	24,956,800	—	—	98,800	0·4
*ROUGH GRAZINGS	5,442,000	5,419,900	22,100	0·4	—	—
ARABLE LAND	9,113,000	9,397,900	—	—	284,900	3·0
PERMANENT GRASS :						
For Hay	4,661,000	4,642,700	18,300	0·4	—	—
Not for Hay	11,084,000	10,916,200	167,800	1·5	—	—
TOTAL	15,745,000	15,558,900	186,100	1·2	—	—
Wheat	1,703,000	1,772,300	—	—	69,300	3·9
Barley	819,000	791,700	27,300	3·4	—	—
Oats	1,417,000	1,418,600	—	—	1,600	0·1
Mixed Corn	97,800	93,900	3,900	4·2	—	—
Rye	19,300	20,500	—	—	1,200	5·9
Beans, for stock feeding or seed ..	121,300	133,300	—	—	12,000	9·0
Beans, for market or canning ..	15,200	20,700	—	—	5,500	26·6
Peas, for stock feeding or seed ..	46,300	42,400	3,900	9·2	—	—
Peas, for canning or packeting, green or dried	28,500	26,900	1,600	5·9	—	—
Green Peas, for market	67,700	63,600	4,100	6·4	—	—
Potatoes, first earlies	56,400	55,100	1,300	2·4	—	—
Potatoes, main crop, including second earlies	399,400	407,700	—	—	8,300	2·0
Turnips, for stock feeding or seed ..	177,200	199,100	—	—	21,900	11·0
Swedes, for stock feeding or seed ..	253,900	277,400	—	—	23,500	8·5
Turnips and Swedes, for human consumption	17,600	21,100	—	—	3,500	16·6
Mangolds	245,800	251,000	—	—	5,200	2·1
Sugar Beet	356,800	367,300	—	—	10,500	2·9
Kohl Rabi	5,400	5,600	—	—	200	3·6
Rape (or Cole)	51,800	51,500	300	0·6	—	—
Cabbage and Savoys for fodder ..	16,900	24,600	—	—	7,700	31·3
Kale, for fodder	100,700	88,000	12,700	14·4	—	—
Cabbage, Savoys, Green Kale and Sprouting Broccoli, for human consumption	43,500	37,500	6,000	16·0	—	—

* Mountain, Heath, Moor, Down and other rough land used for grazing.

AGRICULTURAL RETURNS, 1936

Distribution	1936	1935	Increase		Decrease	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
Brussels Sprouts	35,000	34,100	900	2·6	—	—
Cauliflower or Broccoli (non-sprouting)	20,500	19,500	1,000	5·1	—	—
Carrots	16,900	15,800	1,100	7·0	—	—
Vetches or Tares	62,200	53,800	8,400	15·6	—	—
Lucerne	38,100	36,000	2,100	5·8	—	—
Hops	18,300	18,300	—	—	—	—
Small Fruit	59,900	59,500	400	0·7	—	—
Orchards	257,700	262,400	—	—	4,700	1·8
CLOVER AND ROTATION GRASSES :						
For Hay	1,338,500	1,388,600	—	—	50,100	3·6
Not for Hay	760,500	945,400	—	—	184,900	19·6
TOTAL	2,099,000	2,334,000	—	—	235,000	10·1
BARE FALLOW	334,000	287,700	46,300	16·1	—	—

The total area used for agriculture in England and Wales on June 4, 1936, according to returns made by occupiers of agricultural holdings exceeding one acre in extent, was 30,300,000 acres, a reduction of 76,600 acres compared with the total for 1935. Rough grazings included in this area, which last year showed a slight reduction, increased this year by 22,000 acres, while the area under crops and grass, at 24,858,000 acres, fell by about 99,000 acres, this decline following one of 73,000 acres between 1934 and 1935. The area of arable land resumed the decline which had been interrupted in 1935, the total this year being 9,113,000 acres or 285,000 acres (3 per cent.) below the 1935 area. The greater part of this reduction is attributable to clover and rotation grasses, which declined by 235,000 acres, or 10·1 per cent., bringing the area to 2,099,000 acres, a figure still rather above that of 1934. The area under bare fallow, which declined last year by 52,000 acres, recovered this year almost the whole of that loss, the total, at 334,000 acres, showing a rise on the year of 46,000 acres. The area under all crops other than clover and rotation grasses fell from 7,064,000 acres in 1935 to 7,014,000 acres this year, a decline of 50,000 acres or 0·7 per cent. The area under permanent grass recovered the greater part of last year's decline, the total of 15,745,000 acres being 186,000 acres, or 1·2 per cent. in excess of that for 1935.

The total area under cereals showed a decline of 41,000 acres from 4,097,000 to 4,056,000 acres. This is much the same decline as that registered in 1935, but whereas last year a sharp fall in the barley area was partly compensated by increases in wheat and oats, this year there has been an appreciable fall in wheat, and a partial recovery in barley, with oats showing a relatively slight change. The potato acreage has again declined slightly, and decreases in acreage were registered for all roots.

Cereals.—Last year an increase of 13,000 acres was recorded under wheat, but this year there has been a decline of 69,000 acres or 3·9 per cent. On the other hand barley, which declined last year by 69,000 acres,

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has registered an increase of 27,000 acres, or 3·4 per cent. The area under oats is hardly altered at 1,417,000 acres, while an increase of 3,900 acres (4·2 per cent.) under mixed corn and a decrease of 1,200 acres (5·9 per cent.) under rye reverse the direction of the changes registered last year.

Beans and Peas.—The area under beans for stock feeding or seed declined by 12,000 acres, or 9 per cent. and that under beans for market or canning fell by 5,500 acres, or 26·6 per cent., the total acreage under beans falling by 17,500 acres, compared with an increase of 2,000 acres in 1935. On the other hand, the acreage of each description of peas showed a moderate increase; peas for stock feeding or seed increased by 3,900 acres (9·2 per cent.), those for canning or packeting by 1,600 acres (5·9 per cent.) and green peas for market by 4,100 acres (6·4 per cent.). The aggregate gain of 9,600 acres in the area under peas compares with a decline of 10,200 acres registered in 1935.

Potatoes.—The area under first early potatoes increased by 1,300 acres, or 2·4 per cent., but main crop potatoes, including second earlies, fell by 8,300 acres or 2 per cent., the net result being a further decline in the potato acreage by 7,000 acres, or 1·5 per cent. This follows decreases of rather larger magnitude in each year since 1933, and brings the total potato area to 456,000 acres, the lowest figure since 1931. The acreage returned to the Ministry under potatoes includes all areas of $\frac{1}{4}$ acre and upwards on holdings of over one acre in extent, and is accordingly larger than the acreage returned by registered growers to the Potato Marketing Board.

Sugar Beet.—Last year's decline of 29,000 acres in the area under sugar beet has been followed by a further but smaller decline of 10,500 acres (2·9 per cent.) this year, and the total, at 357,000 acres, is now slightly below that recorded in 1933.

Roots.—The areas under all roots for fodder declined in comparison with last year, turnips falling by 21,900 acres or 11 per cent., swedes by 23,500 acres, or 8·5 per cent., and mangolds by 5,200 acres, or 2·1 per cent. The area under turnips and swedes for human consumption also declined from 21,100 to 17,600 acres, or by 16·6 per cent. This decline in the area under turnips and swedes continues the trend of the previous 12 years, and the total at 449,000 acres, is 413,000 acres less than in 1923. The decrease in the area under mangolds brings the figure back to the 1934 level.

Vegetables for Human Consumption.—Each of the changes recorded in the areas under vegetables for human consumption is in an upward direction. Cabbage (including savoys, green kale and sprouting broccoli) increased by 6,000 acres (16 per cent.), brussels sprouts by 900 acres (2·6 per cent.), cauliflowers and broccoli (non-sprouting) by 1,000 acres or 5·1 per cent. and carrots by 1,100 acres or 7 per cent.

Other Crops.—The most important changes in other crops are increases of 12,700 acres (14·4 per cent.) in the area under fodder kale, and of 8,400 acres (15·6 per cent.) in that under vetches, while a decrease of 7,700 acres (31·3 per cent.) was registered in the acreage of cabbage for fodder.

Fruit.—The area returned as under orchards, which last year showed an increase of 7,500 acres, has declined this year by 4,700 acres or 1·8 per cent., but there has been a slight recovery in the area under small fruit.

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Clover and Rotation Grasses and Meadow Hay.—The decline of 235,000 acres in the area under clover and rotation grasses follows an increase of 260,000 acres in the preceding year. The area for mowing fell by 50,000 acres (3·6 per cent.) while that not intended for hay fell by 185,000 acres (19·6 per cent.). The area of permanent grass increased by 186,000 acres, but the area for hay increased by only 18,000 acres.

Live Stock

With the exception of sheep, which increased in number by 153,500 or 0·9 per cent., all other classes of livestock were fewer in June this year than at the corresponding time in 1935. Cattle showed a decrease of 7,100 or 0·1 per cent.; pigs declined by 12,300 or 0·3 per cent. and horses on agricultural holdings by 9,200 or 1·1 per cent.

	1936	1935	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Cows and Heifers in milk	2,225,200	2,232,100	—	—	6,900	0·3
Cows in Calf but not in milk ..	404,900	382,200	22,700	5·9	—	—
Heifers in Calf	442,800	436,800	6,000	1·4	—	—
Other Cattle :						
Under one year	1,214,900	1,166,900	48,000	4·1	—	—
One year and under two	1,250,000	1,313,700	—	—	63,700	4·8
Two years and above	996,100	1,009,300	—	—	13,200	1·3
TOTAL OF CATTLE	6,533,900	6,541,000	—	—	7,100	0·1
Ewes kept for Breeding	7,226,800	7,124,800	102,000	1·4	—	—
Other Sheep :						
One year and above	1,679,300	1,756,700	—	—	77,400	4·4
Over six months and under one year	437,300	439,600	—	—	2,300	0·5
Under six months	7,287,100	7,155,900	131,200	1·8	—	—
TOTAL OF SHEEP	16,630,500	16,477,000	153,500	0·9	—	—
Sows kept for Breeding	483,100	494,100	—	—	11,000	2·2
Other Pigs : Over two months ..	2,218,900	2,114,300	104,600	4·9	—	—
Under two months	1,099,100	1,205,000	—	—	105,900	8·8
TOTAL OF PIGS	3,801,100	3,813,400	—	—	12,300	0·3
Horses used for Agricultural purposes (including Mares for Breeding)	560,700	586,400	—	—	25,700	4·4
Unbroken Horses (including Stallions) : One year and above ..	95,800	93,700	2,100	2·2	—	—
Under one year	50,600	47,000	3,600	7·7	—	—
Other Horses	157,500	146,700	10,800	7·4	—	—
TOTAL OF HORSES	864,600	873,800	—	—	9,200	1·1

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				1936	1935	Increase		Decrease	
				No. Thousands	No. Thousands	No. Thousands	Per cent.	No. Thousands	Per cent.
Fowls : Over 6 months old ..				25,267	26,633	—	—	1,366	5·1
Under 6 months old ..				32,139	31,657	482	1·5	—	—
TOTAL				57,406	58,290	—	—	884	1·5
Ducks				2,588	2,487	101	4·1	—	—
Geese				630	646	—	—	16	2·5
Turkeys				734	684	50	7·3	—	—

Cattle.—As in 1935, a further reduction in the number of cattle has to be recorded this year, the total number (6,533,900) being slightly smaller than the total number in June, 1935. Cows in calf, heifers in calf and cattle under one year old have all increased in number, but the other categories are responsible for decreases of greater amount. Dairy stock has increased since June, 1935, by nearly 22,000 animals or 0·7 per cent., but other cattle have diminished by approximately 29,000 head or 0·8 per cent.

Sheep.—The total number of sheep is 16,630,500 as compared with 16,477,000 in June, 1935—an increase of 153,500. Ewes kept for breeding and lambs under six months old each show appreciable increases, amounting to 1·4 per cent. and 1·8 per cent. respectively, and these increases more than counterbalance the decreases amongst other classes of sheep.

Pigs.—Pigs, which in June, 1935, were considerably greater in number than in the previous year, show this year a small decline, a decrease of 12,300 being recorded. This decrease is accounted for mainly by the smaller numbers of pigs under two months old which, at 1,099,100, are 105,900 or 8·8 per cent. less than in 1935. Sows kept for breeding show a decrease of 11,000 or 2·2 per cent., but other pigs over two months old are responsible for an increase of 104,600 or 4·9 per cent.

Horses.—The total number of horses on agricultural holdings shows a further decrease this year, largely as a result of a decline in the number of horses used for agricultural purposes, such horses being 25,700 or 4·4 per cent. fewer than in 1935. This decrease is partly offset by larger numbers of unbroken horses (including stallions) and other horses on agricultural holdings. Since last year there have been increases of 5,700 and 10,800 respectively amongst such horses. The decrease in the total number of horses on agricultural holdings and in horses used for agricultural purposes is general throughout the whole country.

Poultry.—A further decline in the number of fowls is shown by the Returns, a decrease of 1,366,000 or 5·1 per cent. amongst birds over six months old having been only partly counterbalanced by an increase of 482,000 or 1·5 per cent. amongst fowls under six months old. The reduction in the number of fowls thus amounts to 884,000 or 1·5 per cent. Geese also show a decline of 2·5 per cent., or 16,000 birds. The other

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classes of poultry, namely, ducks and turkeys, are responsible for larger numbers this year than in 1935, ducks having increased from 2,487,000 to 2,588,000—a gain of 101,000 or 4·1 per cent.—while turkeys number 734,000 as against 684,000, an increase of 50,000 or 7·3 per cent.

Agricultural Workers

	1936	1935	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Regular Male Workers :						
21 years old and over	401,300	413,100	—	—	11,800	2·9
Under 21 years old	100,500	104,700	—	—	4,200	4·0
TOTAL	501,800	517,800	—	—	16,000	3·1
Casual Male Workers :						
21 years old and over	57,900	67,800	—	—	9,900	14·6
Under 21 years old	8,000	9,200	—	—	1,200	13·0
TOTAL	65,900	77,000	—	—	11,100	14·4
TOTAL MALE WORKERS, REGULAR AND CASUAL	567,700	594,800	—	—	27,100	4·6
Women and Girls :						
Regular Workers	44,600	50,100	—	—	5,500	11·0
Casual Workers	27,800	28,300	—	—	500	1·8
TOTAL	72,400	78,400	—	—	6,000	7·7
TOTAL WORKERS, ALL CLASSES ..	640,100	673,200	—	—	33,100	4·9

All classes of agricultural workers show a decline in numbers as compared with 1935, the total decrease amounting to 33,100 or 4·9 per cent. ; the decrease in the previous year was 2·1 per cent. In numbers, the greatest decrease has occurred amongst regular male workers of 21 years of age and over, but proportionately, the largest decrease was amongst casual adult male workers, the decrease in this instance amounting to 14·6 per cent. Amongst male workers the decrease is 27,100 or 4·6 per cent., whilst among women and girls the decrease amounts to 6,000 or 7·7 per cent.

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Milk Marketing Scheme : Revision of Prices and Terms of Contract for 1935-36. The findings of the Committee of Investigation for England on the complaints of the Central Milk Distributive Committee and the Parliamentary Committee of the Co-operative Congress as to the operation of the Milk Marketing Scheme were summarized in the June issue of this JOURNAL.

In pursuance of the provisions of the Agricultural Marketing Act, 1931, the Minister informed the Board of the action that he proposed to take on the Committee's findings, and that he would consider any representations the Board wished to make. The Board submitted certain representations and, after considering these and consulting the Board of Trade, the Minister informed the parties of his decisions. The principal matters affected were the prices of milk for liquid consumption and for manufacture into cheese and butter, the procedure for the approval of collecting depots and manufacturing premises and certain miscellaneous terms of the contract. A note on the Minister's action regarding the wholesale price of milk for liquid consumption appeared in the July issue of this JOURNAL. His decisions in the other matters are as follows:

Price of Milk for Manufacture into Butter. The Minister requested the Board to prescribe a formula for ascertaining the price of milk for manufacture into butter in place of the fixed price of $3\frac{3}{4}d.$ per gal. which they had prescribed in the contract. This formula provides that the price per gallon shall be the weighted average price per cwt. of Danish, Australian and New Zealand butter, less 16s., divided by 275 in the six winter months and by 295 in the six summer months, plus a sum of $\frac{1}{10}d.$, the operation of the formula to be subject to a minimum price of $3d.$ per gal. The premium of $\frac{1}{2}d.$ per gal. payable in respect of milk manufactured in the county of Cornwall is continued.

Price of Milk for Manufacture into Cheese. The Minister requested the Board to modify the formula prescribed by them for the winter months, in accordance with the recommendation of the Committee of Investigation. The revised formula bases the price of milk for this purpose on the weighted average price of Canadian and New Zealand cheese, instead of on the simple average.

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Approval of Collecting Depots and Manufacturing Premises. The Minister has made an Order* under Section 9 (5) (a) of the Agricultural Marketing Act, 1931, amending the Milk Marketing Scheme to provide that when depot or manufacturing premises have been approved by the Board, approval should not be withdrawn or the conditions of approval altered except on good grounds and after due notice has been given. Provision is made for arbitration in any case where the owner of the depot or factory is aggrieved by the action of the Board in withdrawing approval or altering, or adding to the conditions.

Other Terms of the Contract. The recommendations of the Committee of Investigation under this head concerned the alteration of the contract so as to provide for alternative penalties in the case of failure to deliver the permitted minimum gallonage where the milk is sold on level delivery terms; for more than one delivery to be made daily by a producer in agreement with the purchaser; for the reference to a "consulted person" of matters in dispute between the Board and the Central Milk Distributive Committee as to which the Board may require under the contract to be "satisfied"; and, in the case of a variation of the regional price on the certificate of a consulted person, for extending the grounds on which such a certificate may be granted.

The Committee did not recommend that any alteration should be made in the 1935/36 contract, but suggested that adjustments should be made in future contracts. The Board has given satisfactory assurances to the Minister with regard to these matters.

Sales during July, 1936. Pool prices and rates of producer-retailers' contributions for July, 1936, are given below, with comparative figures for June, 1936, and July, 1935. The wholesale liquid milk price in July was 1s. 1d., in June, 1936, 1s. 0d., and in July, 1935, 1s. 1d. per gal.

Region	Pool Prices			Producer-Retailers' Contributions		
	July 1936 d.	June 1936 d.	July 1935 d.	July 1936 d.	June 1936 d.	July 1935 d.
Northern	9½	9	10	3	2½	2½
North-Western	9½	9	9½	3	2½	2½
Eastern	10	9½	10½	2½	2½	2½

* S. R. & O., 1936, No. 767. Obtainable from H.M. Stationery Office, price 1d., post free 1½d.

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Region	Pool Prices			Producer-Retailers Contributions		
	July 1936	June 1936	July 1935	July 1936	June 1936	July 1935
	d.	d.	d.	d.	d.	d.
East Midland	9½	9	10	2 ½	2 ½	2 ½
West Midland	9½	8½	9½	3	2 ½	3
North Wales	9½	8½	9½	3	2 ½	3
South Wales	9½	9	10	3	2 ½	2 ½
Southern	10	9½	10½	2 ½	2 ½	2 ½
Mid-Western	9½	8½	9½	3	2 ½	3
Far-Western	9½	8½	9½	3	2 ½	3
South-Eastern	10½	9½	10½	2 ½	2 ½	2 ½
Unweighted Average ..	9·68	9·05	9·89	2·86	2·59	2·71

These prices do not include any premiums for special services or level deliveries, or for accredited milk.

The number of accredited producers was 17,457 and the sum required for the payment of the premium to them was equivalent to a levy of 0·345*d.* per gal.

The inter-regional compensation levy was fixed at 1½*d.* per gal. on liquid milk sales, compared with 1½*d.* per gal. in July, 1935. A levy of ¼*d.* per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	July, 1936 (estimated)	July, 1935
	Gal.	Gal.
Liquid	47,289,779	46,832,962
Manufacturing	37,302,699	34,029,557
	<hr/> 84,592,478	<hr/> 80,862,519
Percentage liquid sales	55·9	57·9
Percentage manufacturing sales	44·1	42·1

The average realization price of manufacturing milk during July was 5·05*d.* per gal. compared with 5·38*d.* per gal. for July, 1935. The quantity of milk manufactured into cheese on farms was 2,712,414 gal. compared with 2,700,394 gal. in June and 2,149,413 gal. in July, 1935.

Proposed Amendment of the Scheme. Following a favourable poll of the producers, the Milk Marketing Board duly submitted to the Minister certain amendments of the Milk Marketing Scheme. The period during which objections or representations may be made with respect to the draft amendments, expires on September 2.

Milk Products Marketing Scheme—Notice of Submission.
A scheme under the Agricultural Marketing Acts, 1931 to 1933,

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for regulating the marketing in Great Britain of certain milk products, viz., butter, cheese, condensed milk, cream and dried milk, has been submitted to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

Copies of the scheme may be obtained on payment of 6d. net per copy, from the National Association of Creamery Proprietors, Shell Mex House, Strand, London, W.C.2, or may be inspected at that address and at the offices of the Scottish Milk Marketing Board, 95, Bothwell Street, Glasgow, C.2 (except on public holidays), between the hours of 10 a.m. and 5 p.m. on weekdays other than Saturdays and between 10 a.m. and 12 noon on Saturdays.

Any objections and representations with respect to the scheme should be made to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, and addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or to the Under-Secretary of State for Scotland, Scottish Office, Whitehall, London, S.W.1, or to the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, so as to reach them not later than September 30, 1936; objections received after that date will not be considered. Every objection must be made in writing and must state the grounds of objection and the specific modifications required.

Pigs and Bacon Marketing Schemes: *Pig Prices for August, 1936.* The basic pig price (Class I, Grade C) for August, 1936, was 11s. 6d. per score compared with 11s. 4d. in July. The ascertained bacon price rose from 89s. 7d. to 90s. 8d. per cwt., whilst the realization value of offals declined from 9s. 1d. to 8s. 8d.; the cost of the feeding stuffs ration was 7s. 10d. per cwt.

Terms and Conditions of the Bacon Pig Contract for 1937. The following is a summary of a further statement by the Joint Policy Committee of the Pigs and Bacon Marketing Boards, indicating the results of the negotiations which have taken place since the statement issued on May 28, 1936.*

Range of Weights in Class I. The range of weights in Class I is to be from 7 score to 8 score 7 lb. and grades are to be designated by letters (A, B, C) and not by numbers. A basic pig will be a Grade B pig in Class I.

* See the July, 1936, issue of this JOURNAL, page 355.

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Price and Margins between Grades and Classes. The guaranteed average minimum prices for the basic pig remain unchanged, but the difference between the prices for the various Classes will be as follows:—

Classes II and III—3*d.* per score less than Class I.

Class IV —6*d.* per score less than Class I basic price.

The bonus for Grade A pigs has been increased from 3*d.* to 6*d.* per score and the deduction for Grade C pigs has been increased from 3*d.* to 6*d.* per score. In addition to Grades A, B and C, there will be two further Grades, F and L, for which the prices will be 1*s.* 3*d.* per score and 9*d.* per score respectively below the basic price of the Class.

Changes have also been made in the seasonal graduation of the guaranteed minimum prices. Other alterations relate to the allowance in the pig price for a rise in bacon prices and for a rise or fall in feeding-stuff costs

The agreed guaranteed minimum prices are conditional upon the number of pigs under contract being not less than 2,200,000 and the Pigs Marketing Board have undertaken to ensure that number of pigs as a minimum. Registered curers will not be permitted to buy pigs of contract weights on the open market for conversion into bacon, except as authorized under the Bacon Marketing Scheme to replace contract defaults or deficiencies.

Distribution of Contract Pigs amongst Curers. Arrangements have been made between the Boards to ensure that contract pigs will be distributed among all registered curers in accordance with bacon sales quotas to be issued by the Bacon Marketing Board. Registered curers will be entitled to make direct contracts with pig producers up to their share of the minimum of 2,200,000. Any pigs on contract in excess of 2,200,000 will be at the disposal of the Pigs Marketing Board to be distributed amongst registered curers in the same proportion as the 2,200,000.

Insurance and Transport Arrangements. These arrangements will be on the same general lines as in 1936. There will be no change in the transport flat rates or in the rebates applicable where curer or producer provides conveyance of pigs by road, but the minimum load for conveyance by road in railway companies' vehicles will be 8 pigs, made up in not more than four collections.

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Live-weight Contracts. The Pigs Marketing Board will issue a form of contract upon a live-weight basis. These contracts will be between producers and the Board, and will be paid for on the live-weight of the pig, less deductions on a specified scale from live to dead-weight, and plus or minus grade additions or deductions applicable to the carcass.

The Committee's statement, in conjunction with that issued on May 28, 1936, sets out the salient features on which the 1937 contracts will be drawn. The statements are not intended, however, to be exhaustive and for full details, producers and curers must refer to the printed contracts when issued.

Regulation of Imports of Bacon. The position with regard to supplies of bacon in the United Kingdom during the four months, September to December, 1936, has been considered, and the quota for imports from foreign sources has been determined in the light of prospective home and Dominion supplies during that period. The total foreign quota is at a rate about 12 per cent. lower than that for the previous four months, or about 7·7 per cent. lower than the rate which operated, with very slight variations, for the period October, 1935, to April, 1936. The allocations to individual foreign countries are as follows:—

<i>Country</i>						<i>Allocations Sept. 1 to Dec. 31, 1936 (a) cwt.</i>
Denmark	..	..	..	..	..	1,017,358
Netherlands	..	..	..	..	..	152,203
Poland	..	..	..	..	..	127,370
Sweden	..	..	..	..	..	75,300
Lithuania	..	..	..	..	..	47,263
Estonia	..	..	..	..	..	12,016
Finland	..	..	..	..	..	6,409
Latvia	..	..	..	..	..	11,215
U.S.S.R.	..	..	..	..	..	13,618
Argentina	..	..	..	..	..	11,215
U.S.A.	..	..	..	..	..	128,171
Allowance for imports from foreign countries not scheduled to the Bacon (Import Regulation)						
Orders	..	..	..	..	..	38,762
Total						<u>1,640,900</u>

(a) Subject to amendment, in the case of certain countries, in respect of overshipments or undershipments in previous periods.

Regulation of Imports of Meat, January-June, 1936.
The following statement shows imports of meat from Empire

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countries in January-June, 1936, compared with the agreed maxima for the half-year in the case of beef and veal and frozen pork, and for the year in the case of mutton and lamb; and imports from foreign countries compared with the total foreign allocations for the first half of the year.

	Empire countries		Foreign countries	
	Agreed maxima ooo cwt.	Imports ooo cwt.	Allocations ooo cwt.	Imports ooo cwt.
Chilled and Frozen Beef and Veal ..	1,140·9	1,015·2	4,562·1	4,589·9
Frozen Mutton and Lamb	5,650·0*	2,782·5	759·9	766·4
Frozen Pork ..	491·4†	487·3	134·2	73·9

* Agreed maximum for the year 1936.

† Includes one-half of the allocations for baconer carcasses to Australia and New Zealand for the year 1936.

Regulation of Imports of Processed Milks. The arrangements for the regulation of imports of processed milks from foreign sources, referred to in the June, 1936, issue of this JOURNAL (p. 273) are being continued pending a decision on future policy in the light of the recommendations of the Import Duties Advisory Committee on the application made to them for an increase in the import duties on these commodities.

The arrangements for imports of condensed milk from the Irish Free State in 1936 have been modified to permit the importation, in each period of regulation, of the full quantities

Source	Condensed Skimmed Milk	Condensed Whole Milk	Milk Powder	Cream
	cwt.	cwt	cwt.	cwt.
Foreign countries—				
Allocations	653,000	122,000	33,000	20,000
Imports	630,000	95,000	17,000	16,000
Irish Free State—				
Allocations	42,000	11,000	*	12,000
Imports	39,000	10,000	—	16,000
Other Empire Countries—				
Imports :				
January-June, 1934	—	33,000	108,000	—
" " 1935	—	64,000	95,000	—
" " 1936	—	35,000	105,000	—

* Imports of Milk Powder from the Irish Free State are not at present subject to regulation.

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imported in the corresponding period of the basic year, 1933. Imports of cream from the Irish Free State remain subject to a percentage reduction half as great as that applied to imports from Denmark, the principal foreign source of supply.

Imports of processed milks in the first half of 1936, together with the allocations made to foreign exporting countries and the Irish Free State, and imports from other Empire countries in the first six months of the two previous years, are shown in the table (bottom of p. 573).

Milk Acts, 1934 and 1936 : *Manufacturing Milk.* Advances made by the Ministry up to August 15, 1936, in respect of manufacturing milk, were as follows:—

Section		Period of Manufacture	Gallons	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934 to May, 1936	.	
2	Manufactured by the Board ..	April, 1934 to September, 1935	399,517,405	2,079,968
3	Made into cheese on farms ..	April, 1934 to March, 1936	2,573,662	12,850
			32,236,042	175,755
	Total for England and Wales ..		434,327,109	2,268,573
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934 to May, 1936		
			46,182,826	314,442

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 to 1936, in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland, to be 5·20 pence per lb. for the month of August, 1936. This is the first occasion on which the cheese-milk price under the Milk Acts has exceeded the standard price (5*d.* for the months April to September, and 6*d.* for the months October to March). No advances are, therefore, payable in respect of milk manufactured in Great Britain during August. The cheese-milk price must, however, exceed the standard price by more than 1*d.* before the repayment provisions of the Acts come into operation.

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Milk-in-Schools Scheme. Exchequer contributions up to August 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 36,240,227 gal. of milk to school-children at reduced rates during the months October, 1934, to April, 1936, amounted to £705,848. The following statement compares the gallonage consumed in the first seven months of the first and second years of the scheme.

<i>Month</i>		<i>1st Year Gallons</i>		<i>2nd Year Gallons</i>
October	..	1,971,610	..	2,271,784
November	..	2,448,057	..	1,950,453
December	..	1,771,345	..	1,561,422
January	..	2,174,350	..	1,896,652
February	..	2,347,120	..	2,043,636
March	..	2,388,063	..	2,275,251*
April	..	1,648,414	..	1,395,819*
Total for seven months		14,748,959	..	13,395,017

* The figures for these months will be increased when further returns are received.

Experimental Milk Supply Scheme in the Rhondda Valley. On July 29, the Minister announced, in reply to a question in the House of Commons, that the Milk Marketing Board, with the co-operation of the Commissioner for the Special Areas, England and Wales, the Rhondda Urban District Council and the local distributors, had instituted an experimental scheme for the supply of milk to nursing and expectant mothers and to children in the Rhondda Valley at the reduced price of 2d. a pint, which is less than two-thirds the normal average retail price. It is proposed that these facilities should be made available until September 30, 1937. Under the scheme the distributors accept a reduced margin of 8d. a gal. (compared with the normal average margin of over 10d. a gal.) and the Milk Board and the Commissioner for the Special Areas each pay half the further amount (about 7d. a gal.) necessary to enable the milk to be sold at the reduced price. The Rhondda Urban District Council are co-operating in the local administration of the scheme. The milk is delivered to the consumer, and the minimum quantity per head to be supplied under the scheme is one pint per day. A greater quantity can be supplied to individuals on the certificate of the Medical Officer of Health, who is responsible for the supervision of the whole scheme, including approval of the source of supply.

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The Cattle Fund. Payments under the *Emergency Provisions) Acts, 1934 and 1935* to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted, by August 15, to £7,308,223. These payments were in respect of 3,083,196 animals, the average payment per beast being £2 7s. 5d. Some 933,962 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Wheat Act, 1932. *Sales of Home-grown Wheat, Cereal Year 1935-36.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1935, to July 31, 1936, cover sales of 33,443,540 cwt. of millable wheat as compared with 35,751,041 cwt. in the corresponding period (to August 2, 1935) in the last cereal year.

Anticipated Supply for the Cereal Year 1936-37 and new Quota Payments Order. The Minister of Agriculture and Fisheries (on the recommendation of the Wheat Commission) has made Orders giving an estimate of the supply of home-grown millable wheat in the cereal year 1936-37 and reducing the amount of the quota payment which every miller and every importer of flour is liable to make to the Wheat Commission in respect of each hundredweight of his output of flour. The Wheat (Anticipated Supply) No. 2 Order, 1936, estimates the quantity of home-grown millable wheat of their own growing that will be sold by registered growers during the cereal year 1936-37 at 26,000,000 cwt. By the Wheat (Quota Payments) No. 2 Order, 1936, the Minister has, in the light of estimates furnished by the Wheat Commission and of the surplus in the Wheat Fund at July 31, 1936, prescribed that the quota payment in respect of deliveries of flour during the period commencing on August 9, 1936, shall be 9.6d. per cwt. (equivalent to 2s. per sack of 280 lb.). This is a reduction of 1s. per sack on the rate which has been in force since February 23, 1936, and is the lowest rate of quota payment since the Wheat Act came into force.

Copies of the Orders—Statutory Rules and Orders, 1936, Nos. 789 and 790—can be obtained from H.M. Stationery Office, or through any bookseller, each price 1d., post free 1½d.

Ascertained Average Price of Home-grown Millable Wheat in 1935-36. After consultation with the Wheat Commission, the Minister has made the Wheat (Ascertained Average Price)

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Order, 1936, certifying and prescribing that, during the cereal year ended July 31, 1936, registered growers sold 33,650,000 cwt. of millable wheat of their own growing at an average price of 5s. 9-23¹/₂d. per cwt.

National Mark Eggs. In deference to the considered views of the following associations representing the interests of producers and packers, namely, the National Farmers' Union and National Poultry Council, and National Mark Egg Central, Ltd., and on the recommendation of the National Mark Eggs and Poultry Trade Committee, an important revision has been made of the regulations under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, in which statutory grade designations and definitions of quality for home-produced hen and duck eggs are prescribed.

Previous to the promulgation of the revised grades, a referendum of authorized packers operating in the National Mark Egg Scheme was taken by the Ministry, and 87 per cent. by numbers, and 83 per cent. by output, voted in favour of the change in the grade weights for hen eggs which has now been made.

The number of eggs packed under the National Mark during 1935 was over 457 millions, and it is hoped that the revision will result in a large increase in the number of packers enrolled under the Scheme.

The new grade designations and definitions of quality for hen eggs produced in England and Wales are set out below :

Grade Designation	Definition of quality	
	Minimum Weight	State or Condition
New Laid SPECIAL Weight or New Laid SPECIAL ..	oz. 2 ¹ / ₈	First quality, i.e., the egg must not have been preserved by any process and must be free from taint; the shell must be clean, sound, of good texture and shape. The contents must be free from blemish, the yolk central and translucent or faintly but not clearly outlined, the white must be translucent, and the air space must not exceed ¹ / ₄ -inch in depth.
New Laid STANDARD Weight or New Laid STANDARD ..	1 ⁷ / ₈	
New Laid MEDIUM Weight or New Laid MEDIUM ..	1 ¹ / ₂	
New Laid PULLET Weight or New Laid PULLET ..	None	

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The chief alterations are in respect of the minimum egg weights. The weights which are to be superseded are those prescribed 7½ years ago when the National Mark Egg Scheme was introduced. They are as follows: Special weight—2¼ oz., Standard weight—2 oz., Medium weight—1¾ oz., Pullet weight—1½ oz.

The regulations also specify new grade designations and definitions of quality for home-produced duck eggs as follows:

Grade Designation	Definition of quality	
	Minimum Weight	State or condition
New Laid SPECIAL DUCK ..	oz. 2¼	First Quality, i.e., the egg must not have been preserved by any process, the shell must be clean and sound, the yolk central, visible but not dense, and moving freely. The white must be translucent and firm.
New Laid STANDARD DUCK	2	
New Laid SMALL DUCK ..	None	

The regulations* come into operation on September 1, 1936, but there is an overlapping period from that date to September 22, 1936, during which operations may be conducted under either the old or the new regulations. This arrangement has been made in order that the trade may have adequate time after September 1, to adjust itself to the new conditions.

Short Course in the Marketing of Fruit and Vegetables.

Arrangements are being made for a short instructional course in the marketing of fruit and vegetables to be held in September for the benefit of members of the staffs of County Agricultural Education Authorities. The party will be conducted by senior members of the Ministry's inspectorate, and it is intended to visit certain of the London fruit and vegetable markets, in addition to research centres and certain

* Draft and Provisional Rules and Orders, 1936: Agricultural Produce (Grading and Marking), England. Regulations, dated July 25, 1936, as to Grade Designations and Grade Designation Marks for Eggs Produced in England and Wales, etc. (obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1d. net, post free 1½d.).

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farm premises in Kent and Sussex, for the purpose of studying modern methods of fruit and vegetable cultivation.

National Mark Schemes for Fresh Fruit and Vegetables. The official list of authorized packers and registered distributors of National Mark fresh fruit and vegetables (Marketing Leaflet No. 57 (a)) has now been brought up to date, and copies of the revised issue of the leaflet are obtainable on application to the Ministry.

Marketing Demonstrations. A comprehensive range of products packed and graded to National Mark standards will be staged by the Ministry at the Altrincham Agricultural Show on September 16; at the Grocers' Exhibition, Royal Agricultural Hall, London, from September 19-25, and at the North London Exhibition, Alexandra Palace, London, from October 7-24. A working demonstration of the grading and packing of tomatoes will be given on the Ministry's stand at the Altrincham Show, and of the testing, grading and packing of eggs at the North London Exhibition.

National Mark Campaigns. National Mark "Weeks" are being organized in the following towns: Coventry, October 7-17, 1936; Derby, November 11-21, 1936; Norwich, February 10-20, 1937; and Ipswich, March 10-20, 1937.

The principal features of these campaigns will be National Mark exhibitions staged by the Ministry; shop-window display competitions; cinema lectures for housewives and senior school children; and special cooking demonstrations and competitions in order to attract housewives resident in these towns and the surrounding districts.

Irish Free State : Milk (Regulation of Supply and Price) Bill, 1936. A Bill for the regulation of the supply and price of milk was recently introduced by the Minister for Agriculture. It is proposed to empower the Minister to specify sale districts and production districts for milk, and to combine areas of the two types into joint (sale and supply) districts. In each of these joint districts, a board representing producers and distributors would be set up. In the first instance, the members of such a board would be nominated by the Minister, but subsequently they would be elected by the industry: the Chairman, however, would always be nominated by the

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Minister. The Bill provides that each joint board shall keep registers of producers and distributors in their district, and that the registered persons shall render returns as prescribed. Provision is made for the fixing by the Minister of maximum retail prices and, on the recommendation of a board, of minimum prices payable to producers. Under the terms of the Bill, levies would be payable to boards for joint districts; in the case of direct sales to consumers, the levy would be payable by the producer, but registered distributors would pay the levy on all milk acquired or produced by them.

Germany: Storage Accommodation for Grain.—In the summer of 1935, the Reich Statistical Office, in conjunction with the Economic Association of Rye and Wheat Millers, began an enquiry into the storage accommodation in granaries and mills. The results of this enquiry have just been published in *Wirtschaft und Statistik*. The figures show that since the last census, which was taken in 1927, the storage accommodation for grain has increased. Altogether there were, on July 20, 1935, 7,702 storerooms in granaries with a capacity of 4.9 million tons, and 5,475 storerooms in mills with a capacity of 2.1 million tons. The total storage capacity thus amounted to 7 million tons.

Compared with 1927, the number of storerooms in granaries increased by 46 per cent. and their capacity by 58 per cent. The increase in capacity is mainly due to the recent erection of a number of large stores. The storage capacity of granaries holding 500 tons or more increased by 72 per cent. in this period. On the other hand, stores of under 100 tons capacity somewhat decreased. About 74 per cent. of all these storerooms have a capacity of less than 500 tons, but these smaller stores accounted for only 19 per cent. of the whole storage capacity of the country.

Two thousand storerooms with a capacity of 500 tons and more comprised 4 million tons, or 81 per cent. of the whole storage capacity. Of the whole storage capacity of the Reich, 13 per cent. consists of silos, 70 per cent. of granaries and 17 per cent. of auxiliary storerooms. Nearly two-thirds of the grain storage accommodation recorded in the summer of 1935 were built between 1900 and 1932; about one-third was built before the turn of the century. Altogether, 404 new stores were built between 1933 and 1935. The importance of the new stores is, however, greater than appears from the percentage increase, because they are mostly stores of great capacity.

About four-fifths of the storerooms in the mills have a capacity of less than 500 tons, and they comprise 28 per cent. of the whole storage capacity. Stores between 500 and 2,000 tons capacity account for 33 per cent. of the total capacity, and a further 22 per cent. of the storage capacity in the mills belongs to the class of 5,000 tons and more. In contrast with the storage accommodation in the granaries, the greater part of the space in the milling industry is in the form of silos which constitute 52 per cent. of the total storage capacity of the mills. (*Note by the Market Supply Committee.*)

Hungary: New Wheat Marketing Regulations.—Under a new decree issued recently by the Hungarian Government, the wheat farmer will be assured a minimum price varying, according to district, from the equivalent of about 8s. 8d. to 9s. 2d. per cwt. The scale of prices is higher than that adopted last year and will remain uniform for the whole season.

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The Minister of Agriculture points out that the main virtue of the present marketing system is that Hungarian wheat is not affected by price fluctuations on the world market. All exports will be planned and prices for them arranged in advance through the trade agreements.

The "Futura" Company, acting as agent of the Government, will purchase all grain offered at the official price, and will take measures to prevent any under-cutting of the fixed price even in the remotest districts. Apart from these arrangements, the marketing of the wheat crop remains free, except as regards sales to Italy which, as was the case last year, are reserved for the "Futura" Company. Upward price movements will be brought under strict control. Any increase beyond the official minimum price will be discouraged, since such movements make it difficult to carry out delivery obligations to countries with whom the price has been fixed in trade agreements.

Recent estimates indicate that the export surplus will amount to between 700,000 and 800,000 tons. Contracts for the delivery of 720,000 tons have already been made through agreements with foreign countries. Italy will take 200,000 tons and Austria will take 220,000 tons (including flour). The latter country has agreed not to import from other sources until this quota has been filled. A new agreement has been signed with Belgium, which assures the export of 50,000 tons of wheat. (*Note by the Market Supply Committee.*)

SEPTEMBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

At the time of writing, it seems certain that a larger proportion of the corn harvest than usual will be carried over into September. This will retard the cultivation of the stubble and the preparations for sowing winter wheat and oats. However, a dry autumn and early winter should, on balance, give a better sowing season than last year. In 1935, the early harvest and the early start on autumn cultivation promised well, but the break in the weather in October and the continued wet weather after that put an end to further sowing until the spring. The anxiety not to be interrupted again this year will cause growers to get well forward with sowing before getting on to other cultivations.

Seed Wheat. This year, much seed wheat will be ordered this month. There is a wide choice of varieties suitable for various conditions and tastes. Victor, Wilhelmina, Yeoman, Little Joss, Iron III, Squarehead's Master and Weibull's Standard are among those well known and well tried. A recent introduction, Little Tich, a short strawed variety, can be recommended where there is fear of lodging, such as in the western districts. A Shropshire farm bailiff, anxious to "show up" a new variety that he was compelled to use, complained recently that he had failed to "down" a crop of this variety with nitrogenous manures. Benefactor, a rough-chaffed white wheat, has the reputation of being highly suitable for smoky areas. The higher prices of seed wheat arouse interest in the question of seed rate. The low seed rate of autumn sown wheat is made possible by the tillering that takes place in spring, and, in suitable seed beds, a rate of $1\frac{1}{2}$ bushels to the acre should be as good as one of 2 or 3 bushels unless a severe winter follows. Experiments have shown that the lighter seeding gives crops that can stand heavier doses of nitrogen without lodging.

The possibility of buying seed contaminated with Loose Smut was recently mentioned by a Hertfordshire grower. A splendid crop of Victor occupied a portion of a field, having been grown with the intention of providing seed for this autumn's sowing. In the same field, however, a crop of Red Marvel had been sown, and this had a 10 per cent. infection

with Loose Smut. The grower considered that there was a strong chance of the Victor becoming infected from the Red Marvel. Loose Smut cannot be eradicated in the seed by any of the usual surface disinfectants, the infection being internal. The great demand for seed wheat in the spring of this year was responsible for the use of grain that would not have been sold for seed in a season of normal demand, and some lots must have been badly infected with this disease.

The Fodder Question. The disastrous hay harvest has turned attention to the question of fodder supply for the coming winter. The obvious alternative, where circumstances permitted, was a second crop of hay, or the making of silage from the aftermath. Buying hay is expensive for the farmer, because, when one is short, it generally means that many others are in the same position, and prices are high in consequence. When farmers are buyers of hay, they are grateful for the fact that supplies of Canadian hay help to prevent very high prices. One method of tackling the problem consists in modifying the rationing. By cutting down the allowance of hay and straw, and by using the bulky concentrates, such as beet pulp and bran, much can be done to reduce the purchase of hay. The root crop promises well, and an increase in the allowance of swedes and mangolds will also help in reducing the hay requirements.

Clover Seed. Crops of clover, grown for the seed, are harvested at the end of August and during September. The crop has always been regarded as highly speculative, particularly in the west, because of the uncertainty of the weather at this time of the year. However, the crop has in its favour the fact that when conditions have been favourable there has never been a slump in prices. This may be due to buyers having more confidence in the home crop after an excellent harvest. Apropos of the good returns from clover in a successful year, it was jokingly remarked of one farm in the Vale of Clwyd, after an unusually successful year at the beginning of this century, that the children could be seen trailing gold watches about the yard!

Although the weather is more certain in the east than in the west, higher yields are obtained in the latter area, and there is more danger from clover weevil in the former. When a clover crop is to be grown for seed, it should be grazed until

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about the end of May, and then shut up. Captain R. D. Williams, Aberystwyth (*Scottish Farmer*, May, 1936), emphasizes the value of grazing bare before putting up in order to get an even crop, and of not cutting until the seed is ripe. A yield of 5 cwt. per acre may be obtained, and this may realize £5 per cwt. This year, when good hay is scarce, the straw and haulms from the clover will be a welcome addition to the fodder supply of the farm.

Eelworm Effects. Now that the various harvests are in full swing, much is said about losses caused by eelworm, of which pest more is now heard than ever before. This may be due to a greater ability to diagnose this trouble, or to a greater tendency to disregard the old rules of husbandry. Eelworm attacks are brought about by growing a crop too frequently on the same land; most crops are subject to this pest, e.g., potatoes, beet, mangolds, clover, etc. These attacks do not necessarily follow continuous cropping; thus, it is not difficult to find land that, though cropped with potatoes each year for over 30 years, is still free from this pest. Nevertheless, with such cropping, the danger is great, and there is more than one early potato district where recent events have caused anxiety. Again, in the current sugar-beet contracts, it is stipulated that the crop should not be grown on land that was under beet last year. With our present knowledge, sound rotational cropping is the only way of attacking this problem.

Cattle. Though the supply of grass may be good, supplements in the form of concentrates or home-grown foods, such as turnips or cabbages, are necessary to keep up the flow of milk. In a recent discussion on this point at a weekly sale, a producer remarked that the low price for milk now received by wholesale producers would induce less feeding to keep up this autumn flow of milk. The general opinion, however, was against this, it being held that when milk is very low in price, farmers must produce more of it to realize a given amount of money!

Cabbages merit attention as a food for dairy cows from September to December. By the selection of suitable varieties and regulating the times of sowing, the crop may be made available for the cows over the whole of this period. With Early Drumhead, for example, a portion of the crop

may even be ready in time to relieve the situation in August caused by shortage of grass due to summer drought. Drum-head Savoy is one of the later varieties suitable for use at the end of the year. As a crop, cabbages have the advantage that they may be sown early and thus escape the dangers from spring drought and the flea-beetle. On the average farm, where the men are not used to transplanting, it is better to sow the crop and thin as with an ordinary root crop. The yield from a good crop is surprisingly high, 30 or more tons per acre not being uncommon. The loss from diseases does not appear to be heavy, though, with early frosts and continuous wet weather in autumn, some may split and there may be rotting of the leaves at the top.

With cattle fattening on grass, particular attention should be given to the backward ones, if they are to be finished before the end of the grass season. Stubborn cases of husk, or excessive scouring through inability to deal with wet grass may make it worth bringing some cattle indoors, earlier than was intended. With regard to the ration of concentrates for cattle fattening on grass, it is more difficult to give precise figures than for cattle fattening indoors because of the variation in the quality of grass and the difficulty of knowing how much grass is eaten. At the West of Scotland College of Agriculture, Auchincruive, it has been demonstrated once more that there is no gain in feeding more than a moderate weight of concentrates to cattle indoors, and it can be said that with outdoor cattle there is probably as much danger of loss from overfeeding as from underfeeding. Provided there is no shortage of grass, 6-8 lb. per day should be ample for 8-10 cwt. beasts.

Calves should be brought in at night from the end of August because of the cold nights with heavy dew. Cattle under about 8 months old thrive better indoors than outdoors, even in summer. The calf seems to be able to thrive without sunlight and breaks all book-rules by doing well in darkish boxes, with a good thickness of manure underneath.

Sheep. To the hill farmer, September is, in many ways, the most important month of the year, as then practically all his cash receipts are secured. All over Great Britain, store lambs and breeding ewes in immense numbers pass through the sales, which now provide the chief means by which the hill farmer disposes of his annual drafts and the lowland farmer

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replenishes his temporary flocks. First come the sales of crossbred lambs from the lower hill pastures. Many of these are almost fit for the butcher and require only short keep on clover aftermath or on such crops as rape and kale. The lean lambs from poorer grazings require a longer fattening period and will be finished on roots during the winter. Prices of store lambs, therefore, depend very largely on the prospects of autumn and winter keep. Formerly, the condition of the swede crop was much the most important factor, but during the last twenty years the area has been reduced by about half, and correspondingly fewer sheep are required to consume the crop. This reduction in the area of turnips and swedes has by no means been counter-balanced by the use of sugar-beet tops for sheep fattening, and largely accounts for the frequent gluts in the autumn markets for fat lambs and sheep. Numbers in the spring markets, on the other hand, are often short of the quantity required.

The sales of pure-bred lambs from the mountain grazings start a little later in the month. These lambs as a rule do not take kindly to close folding and are usually fattened on pasturage supplemented by concentrated food, and some roots or equivalent forage crop thrown out on the grassland. Coming as they do from very poor land, they have to be gradually accustomed to better herbage, or heavy losses may occur, particularly on land subject to hoar frosts. Braxy may be controlled by inoculation and this is necessary on some farms, but on many others loss may be reduced to very small proportions by judicious selection of fields for the night pasturage of the flock.

Sales of breeding ewes follow the lamb sales, and with them, also, cross-breds are sold before the ewes direct from the high mountain land. The various names under which many of these crosses are known often cause confusion. Thus, sheep of the popular Border Leicester—Cheviot cross, generally known as the Half-bred in their native Border district, are, in the Midlands, often referred to as the Border Leicesters. In Yorkshire, they are described as North Country or Baumshire. The Border Leicester—Blackface cross is variously described as Crossbred, Greyface, or Mule in different districts. The Wensleydale × Swaledale or Blackface cross is a Masham in North Yorkshire, but elsewhere may be known as a Yorkshire cross, while the term Masham is sometimes erroneously used in connexion with

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other crosses. Similarly, a great many ewes sold as Kerry Hills contain a good deal of Welsh Mountain blood, but the writer may perhaps be pardoned for suggesting that they are no worse for that.

In point of numbers, the ewes of the hill breeds are now by far the most important raw material for the making up of "flying" flocks for fat lamb production. Blackfaces easily head the list, with Welsh Mountain and Cheviots following. The age at which they are drafted varies, but is rarely less than four years, as, with the comparatively low proportion of lambs in a mountain flock, it is usually necessary to have three crops of lambs from the ewes if the numbers of the flocks are to be maintained. In Scotland, five years is probably the most common age, and drafting at this age allows a fair proportion of the ewe lambs to be culled out and sold each year—a very important advantage in building up and maintaining a good flock. In sheep, as in cattle, and possibly other animals, high living appears to be one of the causes most likely to shorten life. Sheep kept on poor mountain land retain their teeth and vigour far longer than those feeding on good lowland pastures, so that a ewe brought down at five or six years is usually good for another two years at least as a breeder of fat lambs.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Aug 12				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N 15½%) ..	£ s 7 12d	£ s 7 12d	£ s 7 12d	£ s 7 12d	s. d 9 10
„ „ Granulated (N 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia					
Neutral (N 20·6%) ..	6 14d	6 14d	6 14d	6 14d	6 6
Calcium Cyanamide (N 20 6%)	6 15e	6 15e	6 15e	6 15e	6 7
Kainite (Pot 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot 30%) ..	4 16	4 17	4 15	4 13	3 1
„ „ (Pot 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot 50%)	7 15	8 1	7 17	7 13	3 1
Sulphate „ „ (Pot 48%)	9 6	9 13	9 9	9 4	3 10
Basic Slag (P A 15½%) ..	2 10c	2 0c	..	2 6c	2 11
„ „ (P A 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd Rock Phosphate (P A 26-27½%) ..	2 10a	2 5a	2 8a	2 5a	1 8
Superphosphate (S P A 16%)	2 19	..	2 19f	2 16g	3 6
„ „ (S P A 13½%)	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N 3½%, P A 20½%)	.	6 17	6 5h	6 0	.
Steamed Bone Flour (N ½%, P A 27½-29½%) ..	5 12	5 10	5 0h	4 15	..

Abbreviations N = Nitrogen; P A = Phosphoric Acid,
S P A = Soluble Phosphoric Acid, Pot = Potash

* Prices are for not less than 6 ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid prices.

§ Prices are for not less than 2 ton lots, nett cash for prompt delivery for in town named, unless otherwise stated. Unit values are calculated on f o r prices.

a Prices for 4 ton lots f o r Fineness 85% through standard sieve

c Prices for 6 ton lots At Bristol, f o r Bridgewater, at Hull and Liverpool, f o r neighbour ing works, and at London, f o r depots in London district Fineness 80% through standard sieve

d For lots of 4 tons and under 6 tons the price is 1s per ton extra, for lots of 2 tons and under 4 tons 5s per ton extra, and for lots of 1 ton and under 2 tons 10s extra

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s per ton extra, for lots of 1 ton and under 2 tons 10s per ton extra, for lots of 10 cwt and under 1 ton 15s extra, and for lots of less than 10 cwt but not less than 2 cwt 20s extra

f Prices shown are f o r Widnes

g Prices shown are f o r northern rails, southern rails 1s 3d extra.

h Prices shown are f o r Appley Bridge

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22 4 lb) so that a manure, for example, with 16 per cent nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation see Advisory Leaflet No 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,
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Food and Butter Fat. The general considerations that underlie the relations of food to body-fat apply also to the question of the influence of food on the consistency and palatability of butter-fat. The consistency of butter is influenced by the individuality of the cow, the nature of the food and the mode of manufacture of the butter.

So far as the influence of food is concerned, grass pastures and other green feeds give a soft butter, especially where the pasture is rich in red clover. Hay and silage made from such material do not produce this effect to anything like the same extent, but silage has rather more of a softening tendency than hay.

Roughages and roots in general tend to give a hard and firm butter, there being little difference in this respect between hay and straw. Cereals give good consistency, especially oats, though barley tends to give rather a hard butter, as do also peas and other leguminous grains that are similarly poor in oil. The effect of oil-cakes and meals varies with the amount and nature of the oils present in them. Where the proportion of acids of the oleic type in the food-oil is higher than in normal butter-fat, the tendency will be to soften the butter-fat, whilst with oils poorer in olein the opposite tendency will be found. Thus linseed cake and soya cake have a softening tendency, whilst coconut, palm kernel and cottonseed cakes tend to make the butter firmer.

The effect of a change of feed on the consistency of butter usually begins to be evident about a week after the change, but the effect may vary in intensity as between individual cows and according to the stage of lactation.

Food and Fat Content of Milk. Closely allied with the question of food-fat and body-fat is that of the possible influence of food-fat upon the quantitative secretion of milk-fat. The older experiments of Fingerling and others have demonstrated that, when the oil-content of the ration is steadily reduced, a point is reached at which any further

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diminution tends to lower the secretion of milk-fat, but this point is far below the level of oil-supply in any rations likely to be used in farm practice.

In practical feeding experiments, starting with rations such as are commonly used on the farm, and adding oils or oily food thereto, the great majority of experimenters have failed to detect even a temporary rise in fat secretion that might be ascribed to the added oil. Only in the case of palm kernel and coconut cakes does there appear to be any considerable body of evidence of a specific influence of these foods tending to enrich the milk in fat, this influence being apparently associated with the oils of these foods. Practical opinion on the Continent accepts this evidence as valid, and the inclusion of these foods in the rations of dairy cows is regarded as standard practice. The question has never been investigated on an adequate scale in this country, but such small exploratory tests as have been made have given no encouragement to further work with these foods. It has been, indeed, the almost invariable experience in all experimental work in this country on the influence of food on the fat-content of milk that no significant increase could be detected from any of the variations of food-supply that have been tested. Where the effects of adding oil, rather than oily food, to the ration have been tested experimentally, the only positive results have shown actually a slight depression of the fat-content in certain cases, notably with codliver oil and possibly rice oil.

As against these results, data from American experiments were published a few years ago which showed a marked increase in the fat-content of milk over short periods by additions to the ration of various oils and fats, such as butter-fat, lard, tallow, linseed oil, cottonseed oil, maize oil, groundnut oil, soya bean oil and coconut oil, in amounts from $\frac{1}{2}$ lb. to 2 lb. daily. Whether the fat were added to the ration or substituted for carbohydrates of equivalent energy value, the result was the same. The amount of the change produced was to a large extent proportional to the amount of fat that was fed, and was due to increased secretion of milk-fat since the amount of milk remained practically unchanged. A period of 12 to 24 hours elapsed after the fat was fed before its influence became evident in the milk, and this influence was maintained for 30 to 42 hours after the last fat was fed.

These observations are so strikingly at variance with all previous experience that they can hardly be accepted without

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confirmation, which is not yet forthcoming. On the contrary, indeed, more recent tests on similar lines, both in Ireland and Scotland, have failed to reveal any significant alteration in the fat-content of milk through the addition of oil to rations, beyond the slight depressant effect already mentioned of codliver oil. In any event, as the minimum dose of oil found to be effective in the American experiments was apparently about $\frac{1}{2}$ lb. of oil daily, this method, even if reliable, is hardly likely to find any practical application, except possibly in the milking trials of the showyard if the rules permit.

The problem of improvement of the fat-content of milk through the cow's dietary has been under almost continuous investigation throughout the present century and still awaits solution; as, also, does the problem, even more perplexing and difficult to the agricultural adviser, of the causes and remedy of low non-fatty solids in milk. Both problems are of great economic importance to the dairy industry and will probably find their solution eventually through fundamental research into the physiology of milk secretion rather than through the cumbrous and not very accurate device of the practical feeding trial.

Pig Production. In the following paragraphs, summaries are given of some of the routine data obtained in the course of the work of the Harper Adams Pig Feeding Experimental Station:

Food Consumption of Large White Pigs. During ten years' work of the Harper Adams Station, a large mass of data on the food consumption of groups of pigs ranging from 5 to 20 in size has been accumulated. The great majority of these pigs have been Large Whites.

In the appended table, the results of an analysis of these data are set out, giving the average daily food consumption at or about the live-weights indicated. Milk-fed lots have been excluded.

In the second and third columns, the amounts after the plus-minus sign are intended as an indication of the approximate amount of variation from the average, that must be expected in practice; it has nothing to do with the "probable error" of the mathematician. In no instance, from 50 lb. live-weight onwards, is the average given based on less than 300 pigs, mostly rationed in groups of ten to fifteen; for the middle-weights the averages refer to 800-1,000 pigs in seventy

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to eighty lots. All records, "good, bad and indifferent," have been included, except for a few Lots fed on very abnormal rations, and Lots receiving milk. The data do not represent what the perfect pig in perfect hands *ought* to do, but what ordinary pigs under ordinary management *have done*. The averages per head are rounded off to .05 lb.

The pigs have mostly been given two full feeds daily. From about 5½ lb. per day (160 lb. live-weight) upwards the figures will be rather below the full appetite of the pigs, since, in some of the later experiments, the food supply has been restricted at these higher weights.

Food Consumption of Large White Pigs.

<i>Live weight</i>	<i>Average Food per head per day</i>	<i>Average Food per 100 lb. Live-weight per day</i>	<i>Live-weight</i>	<i>Average Food per head per day</i>	<i>Average Food per 100 lb. Live-weight per day</i>
<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>
30	1.50 ± .15	5.00 ± .50	130	4.75 ± .55	3.65 ± .45
40	1.75 ± .20	4.38 ± .50	140	5.00 ± .60	3.57 ± .45
50	2.10 ± .25	4.20 ± .50	150	5.30 ± .65	3.53 ± .40
60	2.50 ± .30	4.17 ± .50	160	5.60 ± .65	3.50 ± .40
70	2.90 ± .35	4.14 ± .50	170	5.80 ± .70	3.41 ± .40
80	3.30 ± .40	4.12 ± .50	180	6.05 ± .70	3.36 ± .40
90	3.60 ± .45	4.00 ± .50	190	6.35 ± .75	3.34 ± .40
100	3.90 ± .45	3.90 ± .45	200	6.60 ± .80	3.30 ± .40
110	4.20 ± .50	3.82 ± .45	210	6.90 ± .85	3.29 ± .40
120	4.45 ± .55	3.71 ± .45	220	7.20 ± .85	3.27 ± .40

Ratio of Factory Dead-weight to Farm Live-weight.

All live-weights at the farm were taken before feeding on the morning of the day on which the pigs were sent away. Most of the pigs travelled by rail a distance of about thirty miles and were slaughtered about twenty-four hours after leaving the farm. All weights are given to the nearest pound.

<i>Dead-weight Class.</i>	<i>No. of Pigs.</i>	<i>Range of Live-weight.</i>	<i>Average Live-weight.</i>	<i>Average Dead-weight.</i>	<i>Dead-weight as percentage of Live-weight.</i>
<i>lb.</i>		<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	
140-150	186	189-217	197	145	73.8
151-160	162	197-223	208	155	74.8
161-170	180	208-234	218	166	75.8
171-180	159	217-244	229	175	76.3
181-190	113	231-253	242	186	76.8
191-200	79	238-263	250	196	78.3
201-210	60	254-274	262	205	78.3

Summary of Growth Records. A summary of average weights at different ages is appended. All pigs (Large White) bred on the Station, other than actual "wasters," are included.

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<i>Age.</i>	<i>No. of Pigs.</i>	<i>Live-weight.</i> <i>lb.</i>	<i>Age.</i>	<i>No. of Pigs.</i>	<i>Live-weight.</i> <i>lb.</i>
1 day	1,400	2.9	17 weeks	1,090	73.3
1 week	1,348	5.4	18 "	1,070	79.2
2 weeks	1,353	8.3	19 "	1,013	86.8
3 "	1,336	10.8	20 "	1,003	92.7
4 "	1,330	13.2	21 "	1,002	101.6
5 "	1,309	16.0	22 "	1,005	109.1
6 "	1,273	19.3	23 "	1,001	117.3
7 "	1,265	22.7	24 "	998	126.2
8 "	1,223	26.7	25 "	987	134.7
9 "	1,198	30.1	26 "	984	143.6
10 "	1,202	34.6	27 "	970	153.2
11 "	1,164	38.0	28 "	965	162.7
12 "	1,145	43.3	29 "	917	173.9
13 "	1,111	49.4	30 "	898	180.8
14 "	1,107	54.0	31 "	829	189.5
15 "	1,105	60.0	32 "	683	197.1
16 "	1,096	66.9			

The best of the pigs are usually sold at about 26-28 weeks old, so that the data beyond this point are less representative of the weight of the " average pig " at these ages.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	8 0	0 8	7 12	72	2 1	1.12	9.6
Barley, Canadian, No. 4							
" Western	7 3	0 8	6 15	71	1 11	1.03	6.2
" Danubian	6 10§	0 8	6 2	71	1 9	0.94	6.2
" Persian	6 15§	0 8	6 7	71	1 9	0.94	6.2
" Russian	7 2	0 8	6 14	71	1 11	1.03	6.2
Oats, English, white ..	7 0	0 9	6 11	60	2 2	1.16	7.6
" Scotch, white ..	7 7	0 9	6 18	60	2 4	1.25	7.6
" Canadian, No. 2							
Western	8 10*	0 9	8 1	60	2 8	1.43	7.6
" Canadian mixed							
feed	5 17	0 9	5 8	60	1 10	0.98	7.6
Maize, Argentine	5 15	0 7	5 8	78	1 5	0.76	7.6
" DanubianGal.Fox	5 18†	0 7	5 11	78	1 5	0.76	7.6
" South African,							
No. 2 White Flat	6 0†	0 7	5 13	78	1 5	0.76	7.6
Peas, Japanese	17 15†	0 14	17 1	69	4 11	2.63	18.1
Dari	6 17†	0 7	6 10	74	1 9	0.94	7.2
Milling Offals :—							
Bran, British	5 17	0 15	5 2	43	2 4	1.25	9.9
" broad	6 7	0 15	5 12	43	2 7	1.38	10
Middlings, fine, im-							
ported	6 10	0 12	5 18	69	1 9	0.94	12.1
Weatings†	6 12	0 13	5 19	56	2 1	1.12	10.7
" Superfine†	7 5	0 12	6 13	69	1 11	1.03	12.1
Pollards, imported ..	5 17	0 13	5 4	50	2 1	1.12	11
Meal, barley	8 2	0 8	7 14	71	2 2	1.16	6.2
" " grade II	7 7	0 8	6 19	71	1 11	1.03	6.2
" maize	6 2	0 7	5 15	78	1 6	0.80	7.6
" " germ	6 2	0 10	5 12	84	1 4	0.71	10.3
" locust bean	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean	8 5	0 16	7 9	66	2 3	1.21	19.7
" fish (white)	13 10	2 0	11 10	59	3 11	2.10	53
Maize, cooked, flaked ..	6 10	0.7	6 3	84	1 6	0.80	9.2
" gluten feed	5 17	0 12	5 5	76	1 5	0.76	19.2
Linseed cake—							
English, 12% oil ..	9 0	0 19	8 1	74	2 2	1 16	24.6
" 9% "	8 10	0 19	7 11	74	2 0	1.07	24.6
" 8% "	8 5	0 19	7 6	74	2 0	1.07	24.6
" 6% "	8 12§	0 19	7 13	74	2 1	1.12	24.6
Soya-bean cake, 5½% oil	9 15*	1 7	8 8	69	2 5	1.29	36.9
Cottonseed cake							
English, Egyptian							
seed, 4½% oil ..	5 7	0 17	4 10	42	2 2	1.16	17.3
Cottonseed cake,							
Egyptian, 4½% oil ..	5 2	0 17	4 5	42	2 0	1.07	17.3
Cottonseed cake,							
decorticated, 7% oil ..	7 12†	1 7	6 5	68	1 10	0.98	34.7
Cottonseed meal,							
decorticated, 7% oil ..	7 12†	1 7	6 5	70	1 9	0.94	36.8

PRICES OF FEEDING STUFFS (*continued*)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Coconut cake, 6% oil ..	£ s. 6 10	£ s. 0 17	£ s. 5 13	77	s. d. 1 6	d. 0.80	% 16.4
Ground nut cake, 6-7% oil	6 15*	0 17	5 18	57	2 1	1.12	27.3
Ground nut cake, decorticated, 6-7% oil	8 5	1 6	6 19	73	1 11	1.03	41.3
Ground nut cake, imported decorticated, 6-7% oil	7 15	1 6	6 9	73	1 9	0.94	41.3
Palm-kernel cake, 4½-5½% oil	6 15†	0 11	6 4	73	1 8	0.89	16.9
Palm-kernel cake meal, 4½% oil	6 12†	0 11	6 1	73	1 8	0.89	16.9
Palm-kernel meal, 1-2% oil	5 17	0 11	5 6	71	1 6	0.80	16.5
Feeding treacle	4 17	0 8	4 9	51	1 9	0.94	2.7
Brewers' grains, dried alc	4 15	0 10	4 5	48	1 9	0.94	12.5
Brewers' grains, dried porter	4 7	0 10	3 17	48	1 7	0.85	12.5
Dried sugar-beet pulp (a)	5 15	0 5	5 10	66	1 8	0.89	5.2

(a) Carriage paid in 5 ton lots. * At Bristol. § At Hull. † At Liverpool.

† In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the beginning of August, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £9 per ton, then since its manurial value is 19s. per ton as shown above, the cost of food value per ton is £8 1s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 22.4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.16d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N., 6s. 9d.; P₂O₅, 2s. 3d.; K₂O, 3s. 4d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6.2	6 17
Maize	78	7.6	5 15
Decorticated ground-nut cake	73	41.3	8 0
" cotton-seed cake	68	34.7	7 12
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1.72 shillings, and per unit protein equivalent, 1.19 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 15
Oats	60	7.6	5 12
Barley	71	6.2	6 9
Potatoes	18	0.8	1 12
Swedes	7	0.7	0 13
Mangolds	7	0.4	0 13
Beans	66	19.7	6 17
Good meadow hay	37	4.6	3 9
Good oat straw	20	0.9	1 15
Good clover hay	38	7.0	3 14
Vetch and oat silage	13	1.6	1 4
Barley straw	23	0.7	2 0
Wheat straw	13	0.1	1 2
Bean straw	23	1.7	2 2

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Poultry and Rabbit Conferences at Harper Adams College

THE twentieth annual Poultry Conference and the eighth Rabbit Conference will be held at the Harper Adams Agricultural College from September 15 to 17 and on September 19 respectively. The Conference will open on the afternoon of September 15, when papers on duck production, incubation of duck eggs, and White Campbells will be read by Messrs. A. B. Tice and A. N. Dickson, and Capt. F. S. Pardoe. In the evening Capt. E. T. Halnan and Major I. McDougall will give brief reports of their visit to the World's Poultry Congress. The morning session on September 16 will be devoted to systems of commercial egg production and poultry housing, the lecturers being Col. C. D. Roe, and Messrs. H. E. Swepstone and R. H. Hall. In the afternoon Messrs. E. A. King and C. E. Fermor will speak on table poultry, and there will be an inspection of the National Poultry Institute and demonstrations on wax and power plucking, motor mowers, etc., followed by a discussion on laying trials problems, to be opened by Dr. C. Crowther. In the morning of September 17, Prof. A. L. Romanoff, of Cornell University, U.S.A., will lecture on incubation problems, Miss N. Maddison on brooding and rearing, and Mr. A. J. Macdonald and Miss M. S. Miller on intensive turkey production. The afternoon will be devoted to a further inspection of the Institute.

The Rabbit Conference will open on the afternoon of September 19 with an inspection of the rabbit department, after which Mr. W. King Wilson will read a progress report of recent rabbit investigation at the National Institute of Poultry Husbandry. This will be followed by an inspection of pelts and Angora wool samples, and judges' comments on the exhibits. In the evening Mr. J. E. Watmough will speak on "Fifty Years of Rabbit-keeping" and Mr. A. J. Macdonald will read a paper on the use of green foods in rabbit feeding.

Further information concerning the Conference, including particulars of available accommodation, may be obtained on application to the Principal, Harper Adams Agricultural College, Newport, Shropshire.

MISCELLANEOUS NOTES

Midland College Poultry Conference, 1936

THE 13th Annual Poultry Conference at the Midland Agricultural College, Sutton Bonington, Loughborough, will be held on Tuesday, September 22, 1936, and all those interested are accordingly invited to attend. Sir Edward Brown, LL.D., F.L.S., the Chairman, will open the proceedings at 10.45 a.m., after which the morning session will be occupied with Mr. A. E. Singleton's paper on "Laying Batteries on the General Farm," upon which Mr. N. B. Smithson will open the discussion; and Dr. A. G. Ruston's paper—"Factors Affecting Profitable Poultry-keeping"—upon which discussion will be opened by Captain W. J. Coates.

The Afternoon Session will open at 2 o'clock with two presentations—that of the College Challenge Cup to the winner of the Inter-County Laying Trials; and of awards to winners of the Notts Laying Trials. Mr. H. R. Hunter will read a paper on "Problems of the Last Ten Years" (discussion opened by Miss J. Burton); and Major T. Dalling, M.R.C.V.S., will lecture on "Fowl Paralysis" (discussion opened by Mr. F. H. Jones). The papers will be short, to give ample time for discussion. After tea, at 4.30 p.m., there will be an inspection of the College poultry plant, departments, etc.

Intending visitors may obtain full particulars of the Conference, with particulars of charges for board and lodging accommodation, meals, etc., from the Principal of the College, as above. The nearest station (within 10 minutes' walk) is Kegworth, L.M.S. Railway.

International Yearbook of Agricultural Statistics

THE International Yearbook of Agricultural Statistics for 1934-35 has now been published by the International Institute of Agriculture, Rome. First issued in 1910, this publication offers the most complete available collection of statistics of the world's agricultural production, trade and price movements, and is, therefore, invaluable as a source for comparative figures concerning the industry in the various countries.

This latest issue, extending to over 800 pages, is divided into nine chapters, the first four being devoted to the usual statistics of areas under production, cultivation, crop yields,

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livestock numbers (including poultry and egg production), etc. The remaining five chapters deal with such subjects as trade, stocks, prices and fertilizers, which have become essential factors in any study of agricultural economics. Thus, the fifth chapter supplies the import and export statistics of the various countries for the years 1931-34, and the averages for the period 1926-30. In the sixth chapter, are recorded the movements of stock as compiled by, at present, only a small number of countries; the seventh gives the situation of the world markets as regards about 40 agricultural products, the prices, for the purposes of international comparison, being converted to gold francs; and the eighth chapter is devoted to statistics of the production, trade and prices of fertilizers in over 50 countries during the years 1926-34. The ninth chapter, a new feature of the Yearbook, gives the distribution, according to size and mode of tenure, of agricultural holdings in 30 countries.

An examination of the Yearbooks already published shows a steady improvement on the part of the various countries in the compilation and comprehensiveness of their agricultural and commercial statistics; this is a natural consequence of the increasing complexity of world economic problems, and of the statistical study which those problems demand.

Copies of the 1934-35 issue may be obtained from the International Institute of Agriculture, Villa Umberto 1, Rome, price 90 liras, plus 10 per cent. for packing and postage.

The Asparagus Fly

THE Asparagus Fly, *Platyparaea poeciloptera* Schrk., a serious pest of Asparagus on the Continent of Europe, was recently found to be present in two private gardens in Hertfordshire. In Europe, the pest is particularly troublesome in Germany and France, and during the past five years has spread to Holland.

The adult fly is similar in appearance to the well-known Celery Fly, but is slightly larger. The eggs are laid on the young asparagus shoots and the white grubs bore into the stems and tunnel down them: as many as twenty grubs may be found in a single stem. In the early stages, the damage is difficult to detect, but in late July and August the attacked shoots turn yellow and are easily distinguished. If such a discoloured shoot is split open, the tunnels of the grubs will

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be easily seen: the grubs themselves at this stage are $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Eventually the attack causes the shoots to bend over or break, the crowns are weakened, and where the flies are numerous the crop will be reduced or entirely destroyed. As the grubs feed entirely inside the stems, control measures are difficult and it is therefore very desirable that the pest should not be allowed to spread in this country.

Growers of asparagus are therefore requested to be on the watch for the attack, and to forward specimens of suspected damage, to the Ministry of Agriculture, 10, Whitehall Place, London, S.W.1., or to the local Adviser in Entomology.

It is important that the Asparagus Fly should not be confused with a common English fly known as the Cambium Miner. The grubs of this fly tunnel just under the skin of the asparagus stems: they are scarcely half the size of those of the Asparagus Fly and do little damage. The yellowing and eventual breaking of the stems is not caused by the attacks of the Cambium Miner.

It is unlikely that Asparagus Fly damage will be confused with that caused by the Asparagus Beetle, the grubs and adults of which feed openly on the "fern," never tunnelling in the stems.

Dairy Produce Supplies, 1935*

THIS review, issued annually by the Imperial Economics Committee, is a very useful volume of information on imports of dairy produce, poultry and pig products, and will prove invaluable to all interested in the international trade in these commodities. As in previous issues, numerous tables and graphs are included showing prices, quantities imported, and sources of supplies for the year under review and for a number of preceding years.

The Review deals mainly with supplies imported into the United Kingdom, showing the general position compared with 1934 and earlier years, and indicating the most important changes that have taken place in the sources of supplies and in prices. In addition, a brief account of the world trade in these products is given, and appendices have been included dealing with legislative measures in various countries which affect international trade in dairy products.

It is shown that the United Kingdom continued to be easily

* Published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2., price 2s. 6d., post free, 2s. 9d.

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the world's largest importer of dairy produce, poultry and pig products in 1935, although our imports of all the most important products dealt with, other than eggs, declined in volume compared with 1934. Prices, after declining for a number of the preceding years, rose in 1935, so that the imports, although less in quantity, cost £3 million more than in 1934. The share of Empire countries in imported supplies has continued to increase, the proportion of imports of butter, hams, frozen and salted pork and lard from these countries in 1935 constituting a record. At the same time home-produced supplies have formed a greater proportion of the total available for consumption in the United Kingdom.

The value of butter imports in 1935 was higher than that of any other food import, and although gross imports declined by 1 per cent. compared with 1934 they exceeded those of any other previous year. Empire supplies increased from 54 per cent. of the total in 1934 to 57 per cent. in 1935. New Zealand was again the principal source of supply, accounting for 27.5 per cent. of total imports, while Australia provided 22 per cent.; Danish supplies declined from 26 per cent. in 1934 to 23 per cent. in 1935. Butter prices rose from the previous low level; Empire prices rose more than those of Danish produce, thus reducing the margin between them. The estimated consumption per head in the United Kingdom remained at the 1934 level (25.2 lb.), while that of margarine increased by about half a lb. per head.

Imports of cheese into the United Kingdom declined by 9 per cent. between 1934 and 1935, the reduction being in Empire supplies, which amounted to 88 per cent. of total imports in 1935 compared with 92 per cent. in 1934. Supplies from New Zealand were much larger than those from any other country and amounted to 65 per cent. of total imports. Prices rose slightly compared with 1934, and consumption per head is estimated to have declined from 9.4 lb. to 9.1 lb. Imports of condensed milk and milk powder continued to decline, but exports of condensed milk were 35 per cent. higher than in 1934 and nearly double those of 1933.

Total international trade in eggs declined in 1935, but United Kingdom imports were 6 per cent. greater than in the previous year. Denmark was the chief source of supply, accounting for 33 per cent. of our imports; the proportion of Empire supplies fell from 31 per cent. in 1934 to 24 per cent. Bacon imports, which are subject to restriction by quota

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regulation, declined in 1935, but home-produced supplies increased. Denmark was again the largest supplier, but imports from Empire countries increased, forming 20 per cent. of the total compared with 17 per cent. in 1934. Prices of foreign supplies were about the same as in 1934, but those of Empire and home-produced supplies declined slightly.

The statistical information on foreign trade in dairy produce in other countries is of interest as showing some of the effects of the measures adopted in these countries to support the dairy and allied agricultural industries. The Milk and Bacon Marketing Schemes are briefly dealt with, the big expansion in the factory production of milk products and in supplies of home-produced bacon since the introduction of these schemes, being clearly shown.

The Agricultural Index Number

THE general index number of prices of agricultural produce for July is 114 (corresponding month of 1911-13=100), or 2 points lower than in June, but the same figure as that recorded in July, 1935. (If allowance is made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index for the month under review becomes 119.) Average prices of wheat, oats, eggs, butter, cheese and potatoes rose during July, whereas those for fat cattle, sheep and pigs and barley moved downwards.

Monthly index number of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	114
August	121	105	105	119	113	...
September	120	104	107	119	121	...
October	113	100	107	115	113	...
November	112	101	109	114	113	...
December	117	103	110	113	114	...

Grain. The average price of wheat at 6s. 11d. per cwt. was 3d. higher than a month earlier and the index rises by

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2 points to 86. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration, the figure is 114.) Barley at 6s. 4d. per cwt. showed a reduction of 6d., the index declining from 92 to 84, but oats rose from 6s. 2d. to 6s. 4d. per cwt. and the index appreciates 1 point to 83. A year ago wheat averaged 5s. 6d., barley 6s. 7d. and oats 7s. 7d. per cwt., the relative indices standing at 68, 88 and 99.

Livestock. At 35s. 8d. per live cwt. for second quality, fat cattle averaged 9d. less than in the preceding month, although, owing to a larger decrease having taken place during the base period, the index rises by 2 points to 100. The effect of adding the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, brings the index up to 114. Fat sheep were again lower in price, the average for second quality having declined from 9½d. per lb. to 9¼d. and, in consequence, the index falls from 131 to 128. Baconers at 11s. 3d. and porkers at 11s. per score (20 lb.) showed a reduction of 4d. and 6d. respectively, the relative indices declining by 6 points to 113 and 106.

Compared with June values, dairy cows and store cattle were dearer; the index for the former at 104 is higher by 1 point, and that for store cattle at 101 by 5 points. On the other hand, average prices of store sheep were considerably lower, the index falling from 119 to 113. Quotations for store pigs were little altered, and the rise of 4 points in the index to 126 is entirely due to a contrary movement in the base price.

Dairy and Poultry Produce. The regional contract price of milk remained unchanged during July, the index of 162 being repeated. Butter appreciated by ¾d. and at 1s. per lb. realized the average price ruling in the corresponding months of 1911-13, so that the index is 100. Seasonal advances were in evidence in the prices of eggs, the average increasing from 10s. to 12s. 1d. per 120 on the month. At 123 the index is 9 points above the figure recorded for June. Cheese values were only slightly advanced, but on account of a drop of 2s. 6d. per cwt. during the base period, the index moves upwards from 108 to 113. Fowls and ducks realized less money and the indices were lower.

Other Commodities. For the compilation of the potato indices for July and August, average quotations of certain first earlies are taken into consideration. The level of prices

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so far this season is below that of last season and the index at 139 compares with 166 in July, 1935. Prices of both descriptions of hay were little altered on the month, and the combined index at 82 is reduced by 1 point only. At 1s. 0½d. per lb. wool was higher by ½d., but the index remains unchanged.

Monthly Index numbers of prices of individual commodities. (Corresponding months of 1911-13=100.)

Commodity	1934	1935	1936			
	July	July	Apr.	May	June	July
Wheat	66	68	85	84	84	86
Barley	98	88	96	105	92	84
Oats... ..	83	99	85	82	82	83
Fat cattle	99	93	92	94	98	100
„ sheep	128	117	128	130	131	128
Bacon pigs	105	101	111	113	119	113
Pork „	108	97	112	108	112	106
Eggs	97	114	107	109	114	123
Poultry	114	120	115	121	124	117
Milk	168	175	215	162	162	162
Butter	87	87	96	96	98	100
Cheese	90	99	100	103	108	113
Potatoes	136	166	164	174	160	139
Hay	91	99	79	82	83	82
Wool	86	86	97	96	94	94
Dairy cows	104	100	100	101	103	104
Store cattle	85	94	94	96	96	101
„ sheep... ..	108	113	109	107	119	113
„ pigs	135	114	122	118	122	126

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	118*	107*	122	117	117	114
Fat Cattle	—	107	106	107	111	114
General Index	117*	120	129	120	121	119

* Superseding figures previously published.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on Tuesday, July 28, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :

Lincolnshire (Kesteven and Lindsey).—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on August 2, 1936, and to continue in

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operation until January 30, 1937. The minimum rates in the case of male workers of 21 years of age and over are (1) wagoners, 39s. (instead of 38s. as at present) per week of 52½ hours in the week in which Christmas Day falls, 61 hours in any other week from October 15 to May 13, 50 hours in the week in which August Bank Holiday falls, and 58 hours in any other week during the remainder of the year; (2) shepherds, 37s. (instead of 36s. as at present) per week of 45½ hours in the week in which August Bank Holiday falls, 55 hours in any other week in summer, 47½ hours in the week in which Christmas Day falls, 56 hours in any other week in winter, with additional payments for the lambing season; (3) stockmen, 38s. (instead of 37s. as at present) per week of 46½ hours in the week in which August Bank Holiday falls, 56 hours in any other week in summer, 49½ hours in the week in which Christmas Day falls and 58 hours in any other week in winter; and (4) other male workers, 32s. per week of 42 hours in the week in which August Bank Holiday falls, 51 hours in any other week in summer, 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter (as at present) with overtime in the case of all classes of male workers unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 17 years of age and over the minimum rate is unchanged at 5½d per hour for all time worked.

Monmouthshire.—An Order fixing minimum and overtime rates of wages to come into force on September 16, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until March 15, 1937. The minimum rate for male workers of 21 years of age and over is 32s. 6d. (instead of 32s. as at present) per week of 54 hours in summer and 50 hours in winter, the rates for younger male workers being unchanged. The overtime rates for adult male workers remain unchanged at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Christmas Day and Boxing Day. The minimum rate for female workers of 17 years of age and over remains unchanged at 6d. per hour for all time worked.

Enforcement of Minimum Rates of Wages.—During the month ending August 13, 1936, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
Berks ..	Wantage ..	£ s. d. 2 0 0	£ s. d. —	£ s. d. 20 0 0	1
Derby	Derby ..	*	8 0	48 17 8	1
" ..	Swadlincote ..	5 0 0	7 0	70 0 0	2
Devon ..	Lifton ..	2 2 0	—	12 0 0	1
Dorset ..	Dorchester ..	10 0 0	4 0	56 11 10	2
" ..	Sturminster Newton ..	†	2 2 0	51 0 0	4
Staffs ..	Wolverhampton	‡	—	—	1
Anglesey	Amlwch ..	10 0	5 0	10 0 0	1
		19 12 0	3 6 0	268 9 6	13

Probation of Offenders Act.

† Conviction recorded.

‡ Dismissed.

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Foot-and-Mouth Disease.—No outbreak of Foot-and-Mouth Disease has been confirmed since January 26. At the time this issue of the *JOURNAL* went to press, no part of Great Britain was subject to any restriction in connexion with this disease.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATIONAL STAFFS: ENGLAND

Oxfordshire : Mr. S. L. Huthnance, B.Sc. (Agric.), N.D.A., has been appointed Assistant Agricultural Organizer, *vice* Mr. T. Neil, B.Sc. (Agric.), N.D.A.

Northamptonshire : Mr. R. G. Betterton, Dip. Econ. (Oxon), has been appointed Assistant Instructor in Dairying, *vice* Mr. F. I. Williams, N.D.A., N.D.D.

Yorkshire : Mr. J. D. Nutt, B.A., N.D.A., has been appointed Assistant Lecturer in Agricultural Economics.

Mr. D. S. Hendrie, B.Sc., N.D.A., N.D.D., has been appointed District Lecturer in Agriculture, *vice* Mr. W. S. Gibson, B.Sc.

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Lilas de mon Jardin. By Alice Harding. Pp. 110. Illustrated. 1936. (Paris, VI^e: Librairie Agricole et Horticole de la Maison Rustique, 26, Rue Jacob. Price 12fr., post free, 14fr.)

This is an excellent little book on Lilacs that will be appreciated by all who are interested in these flowers. Species, hybrids and cultivated varieties are attractively described, and several are illustrated by excellent photographs.

The methods of multiplication and cultivation advised are excellent ; in the latter connexion, Lilacs are said to grow best in soil either neutral, or with lime present, and in situations exposed to soft winds. A really good book on the subject.

The Journal of the South-Eastern Agricultural College. Edited by the Rev. S. G. Brade-Birks, M.Sc., D.Sc., F.Z.S. No. 38. Pp. 171. (Wye: South-Eastern Agricultural College. July, 1936. Price 7s. post free ; residents in Kent and Surrey, 4s. post free.)

The subjects covered by this issue of the Wye College Journal include "Microscopical Examination of Cattle Foods," "Consolidation of Loam Soils," "Control of Apple Scab," "Downy Mildew of the Hop," "Cladosporium Disease of Hops," "Manuring of Hops," "Hop Drying: Air Supply and Heaters," "Pyrethrum," "Insect and Allied Pests of Cultivated Mushroom," "Weevils, Gall-midges, Miller's Offals, and the Pollination of Plums. Professor C. F. Shaw, the eminent American pedologist, contributes an interesting paper entitled "Some Impressions of British Soils," and Mr. H. Barkworth writes on "Newer Methods of Estimating the Hygienic Quality of Hops." Two new varieties of hops, Fillpocket and Quality, are described by Professor E. S. Salmon. The editor deals with difficulties in regard to the nomenclature and terminology of soils, and concludes the issue with a general article on "The Geology of the Soil." There is a very complete index.

The Apples of England. By H. V. Taylor, O.B.E., B.Sc., A.R.C.Sc. Foreword by Sir A. D. Hall, K.C.B., LL.D., F.R.S. Pp. 266 & 11 figs. (London: Crosby Lockwood & Son, Ltd., 1936. Price 21s.)

This volume is described as the first of a new series of Agricultural and Horticultural Handbooks. Its pleasing paper, restful print and spacing, and delightful drawings and photographs all suggest an easy chair and

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some very happy hours. The reader will not be deceived, for while this is a valuable book of reference, it is something far more. To all those who have been interested in the development of apple-growing over the past twenty years, whether from a commercial or amateur point of view, the book affords a fascinating landmark, from which the reader can look both forward and back. For in "taking stock of the apples in cultivation" the author gives an historical sketch of the development of British varieties from the Pearmain and Costard of the 13th century to the latest unnamed seedlings scientifically bred in the 20th. He has, moreover, created an atmosphere redolent of the succession of Imperial Fruit Shows and Fruit Exhibitions of the Royal Horticultural Society. To those who, like himself, have been such regular attendants and students at these great apple festivals, the book is full of pleasant reminiscence.

The volume is divided into two parts. Part I contains eight chapters, in which Mr. Taylor discusses, in the light of recent scientific knowledge, what is to be considered a variety, whether "sports" and "mutations" deserve that distinction, and how far the popular conception of the "life of a variety" can still be maintained. He traces the origin of the tree from the process of cell division through the juvenile period of "baby foliage" and "seedling vigour" to the stage of "settling down" and then leaves his readers asking the old question whether "as a variety grows older its cropping capacity and resistance to disease decline also?" He thoroughly ground baits the pool with several supposed cases of reduced resistance, of which Warner's King is a notorious example. Incidentally, there are plenty of Warner's King trees of between 19 and 50 years old growing in perfect health and vigour within 25 miles of London. Then, in the next chapter, he supplies plenty of "environmental" pebbles to disturb the waters he has so carefully prepared! Indeed, one suspects that the author is a skilful fisherman, for he has cast a number of flies so deftly that the wary reviewer is almost lured to a rise!

A chapter on "Tree and Leaf Characters" does not confine itself to methods of systematic description but rather unexpectedly develops into a suggestive discussion on the relative susceptibility to, and immunity from, certain diseases and pests, and the question of copper and sulphur injury—and advances some of the possible explanations. Similarly, the chapter on "Blossom and Fruit Characters" describes in detail the process of fertilization and summarizes for the fruit-grower the conclusions of research upon self-fertility and sterility. This leads on to a discussion of "good" and "bad" pollen varieties, an explanation of the influence of chromosomes, and the practical application of that knowledge by the plant breeder.

There follows a chapter on the uses of the apple, and the author is tempted into a dissertation upon flavour and a criticism of the terms used to describe different flavours, though in the end he himself not infrequently succumbs to describing flavours as "aromatic," "crisp" and "choice."

Part I of the book is so packed with general information and discussion that it is with something of a jerk that the reader is brought face to face with the "Classification of Varieties," and is thus reminded that the volume is, after all, primarily a description of the varieties (listed in nurserymen's catalogues) for the use of pomologists. Having been led so far, the reader is likely to regret that those cultural and environmental conditions, about which so much has been learned in the past 20 years, and as a result of which Cox's Orange Pippin has become a commercial proposition, are not similarly brought under review.

In Part II, 175 pages—averaging some 350 words—are devoted to the description and listing of about 590 varieties of apple. Although

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it is extremely impressive to learn that practically all varieties have been handled and judged by the author himself within the last few years, it is a relief, from a commercial point of view, to learn that over 230 of them are no longer listed by nurserymen. Full and interesting descriptions of nearly a page or more are given of some 20 of the most important varieties of to-day and yesterday, whilst a further 30 receive almost as much attention. After giving short historical notes, which not infrequently contain interesting human reminiscences recalling the personalities and notable occasions of the fruit world, the author, who "has attempted to collect the known facts about the varieties grown, and to describe them in terms that would readily be understood by all growers and consumers of apples" briefly gives reasons for the place which each variety has taken in the commercial orchard or private garden, and frequently mentions its particular requirements both as regards pollination and spraying. These "character sketches" contain a lot of up-to-date information in addition to summarizing the general consensus of opinion, though why Newton Wonder escapes so lightly is sure to be debated. They also reveal the author not only as the critical pomologist, but as the enthusiastic devotee of the apple. "Bramley is the greatest cooking apple of the century"; "Blenheim a really superb eating apple with a unique, nutty flavour," and, again, "a really great apple whose fame will go down to history," whilst "the superb flavour of the English-grown Cox suffices to rank it as the greatest apple of this age and the readiest seller in all markets." Some of the author's general observations, as, for instance, of a heap of Allington's having a "grey and transparent appearance," and of Superb being "duller and lacking the bright colours" of Cox, very happily portray characteristics not easily defined.

Finally, there is a systematic description of the tree's habit of growth, foliage, flowers and fruits—this last including shape, skin, stem, eye, flesh, flavour and season, and such contributory features as calyx cavity, core, etc., where particularly distinctive. These characteristics have been established by accurate measurement, precise observation and dissection.

A further 30 varieties receive almost as ample attention, and it is valuable to have detailed descriptions of some of these newer varieties—such as Edward VII, Ellison's Orange, John Standish, Lord Lambourne, Monarch and Laxton's Superb, which have already received commercial recognition. Again, it is interesting to be able to find descriptions of some of the even more recently debated varieties, such as Arthur Turner ("a regular and abundant cropper of early cooking apples"), Barnes A. W., Herring's Pippin, Histon Favourite, Norfolk Royal, St. Cecilia, St. Everard ("our highest-quality early apple") and Woolbrook Pippin, most of which have found their way into the National Fruit Trials at Wisley, through which the author himself has succeeded in interesting the State in variety testing. A dozen of Messrs. Laxton's new succession of dessert apples receive due recognition in the list.

This book is stamped with an impressive "Hall" mark which suggests it "should prove to be the Hogg of this generation." The apple-growers of England have always been unanimous in their appreciation of the Horticulture Commissioner's untiring efforts on behalf of their industry. They can at once show that appreciation and add to their own enjoyment and instruction by seeing to it that *The Apples of England* runs through as many editions as the "Fruit Manual" in as short a time as possible. Every horticulturist who is tempted to send the author a variety for identification should first invest in this book.

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NOTES FOR THE MONTH

Agricultural Education in Yorkshire: Developments at Askham Bryan

THE machinery for the provision of agricultural education in Yorkshire is unique by virtue of the co-operation between the three Ridings working through the Yorkshire Council for Agricultural Education. The scheme financed by the Council at the present time includes the teaching at the Department of Agriculture of Leeds University, where degree, diploma and short courses are given, and, in addition, the normal county activities, such as day and evening classes, lectures, etc., throughout the Ridings. Steps are now being taken to complete these educational facilities by the erection of a farm institute.

The present farm of 349 acres at Askham Bryan, near York, was acquired in 1927, and a scheme for establishing there a residential farm institute, suitable for providing three-term and shorter courses, came under consideration. Details had been worked out and general principles agreed between the Authority and the Ministry in 1931, but progress was held up by the economy measures of that year. The Council have since revived the proposals, and Treasury authority has now been given to a total capital expenditure not exceeding £85,000. The administrative, teaching and residential buildings are now in course of construction and will provide accommodation for 30 men and 30 women students, being capable of extension at a later date for a total of 120 students; the cost of this portion of the scheme will be about £60,000. The remaining outlay defrays the acquisition of an additional 180 acres of land and the erection of farm buildings to allow for the development of dairying and cattle breeding at the farm, and for the establishment of a horticultural unit.

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British Commonwealth Scientific Conference

THE British Commonwealth Scientific Conference, attended by representatives appointed by Governments of the United Kingdom, of all the Dominions, of India and of the Colonies, was opened at No. 6, Burlington Gardens, London, W.1, on September 21. In opening the Conference, the Minister of Agriculture, the Rt. Hon. Walter Elliot, M.C., M.P., referred to the valuable co-operative work in agricultural science effected through the Executive Council of the Imperial Agricultural Bureaux—a body consisting of representatives of all Empire Governments, and inter-Imperially financed. The review of the work of this Council formed one of the main objects of the present Conference. A vote of thanks to the Minister was proposed by Major-General A. G. L. McNaughton, of the Canadian delegation. The Conference then proceeded to elect Lt.-Col. Sir Charles Howell Thomas, K.C.B., K.C.M.G., as Chairman. Sir Charles, who is Chairman of the Executive Council of the Imperial Agricultural Bureaux, gave a short address, in which he reviewed generally the work before the Conference.

The Conference then proceeded to the election of two Standing Committees, under the Chairmanship respectively of Major-General McNaughton and of Dr. P. R. Viljoen, of the South African Delegation. After preliminary discussion, the various items of the Agenda were referred to one or other of these Committees. The Conference then adjourned till Friday, October 2, and in the interval will tour the various scientific centres in Great Britain in whose work they are particularly interested.

National Rat Week, November 2-7, 1936

NATIONAL RAT WEEK begins this year on Monday, November 2, and the Ministry appeals once again to all concerned to make a special effort during that week to destroy rats and mice and to take all possible steps to bring them under control.

The Rats and Mice (Destruction) Act, 1919, requires every occupier of land or premises to take steps to destroy any rats or mice on his property and to prevent the property from becoming infested. Some 720 local authorities in England and Wales are responsible for the enforcement of the Act in their respective areas, and the Ministry has addressed a circular letter to these authorities asking for their co-operation

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in this year's campaign. It is suggested that each authority should arrange for concerted action to be taken by the occupiers of any premises in its area that are known to be infested by rats, and for special measures to be taken in connexion with rubbish dumps, sewage farms, and other properties that are particularly liable to infestation.

Local authorities are also urged to give publicity to the need for destroying rats and mice by distributing literature on the subject, and arranging for the display of the coloured "National Rat Week" poster which has been issued by the Ministry, and of a new sound version of the Ministry's rat film that is now being prepared.

The Ministry's Advisory Leaflet No. 49 on the "Destruction of Rats and Mice" contains much useful information and advice, and a copy of this Leaflet, together with a pamphlet that makes simple suggestions for rat destruction and a list of firms from whom poisons, etc., are obtainable, may be obtained free of charge on application to the Ministry.

Further information on the subject is contained in the Ministry's Bulletin No. 30, "Rats and How to Exterminate Them," copies of which are obtainable through any bookseller, or direct from His Majesty's Stationery Office, price 6d. (7d. post free).

What is Good Farming?

ANYONE who attempts to answer the question "what is good farming?" lays himself open to very considerable criticism. Mr. C. S. Orwin, however, is always fearless in his attack upon all agricultural problems, and in choosing the above title for a paper to read to the Incorporated Society of Auctioneers and Landed Property Agents at an agricultural conference at King's Lynn on Wednesday, September 2, he threw down the gauntlet to many a "Mr. Standfast."

One may always expect fertile ideas in a contribution by Mr. Orwin. He is almost the Bernard Shaw of agricultural writers, and in this sphere he has maintained his reputation for regarding the agricultural problem from an original angle. After a brief historical introduction he postulates the four classic ideas of good farming. These were: (1) good farming is high farming; (2) good farming is mixed farming; (3) good farming is rotation farming; (4) grass farming is good farming; and proceeds to demolish these ideals. High farming is perhaps the easiest to dismiss. He pointed out that, in the

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depression of the nineteenth century, Sir John Lubbock laid down the dictum that high farming is no remedy for low prices. He added, "I am not saying that many farms could not be farmed higher with profitable results. All I mean is that big crops and pedigree stock do not necessarily make a profit balance, and if they do not, then the farming is not good."

Mixed farming is our tradition. It was the backbone of all English farming for centuries and founded the prosperity of the eighteenth century, out of which came much of the capital to support our industrial development. Since the invention of modern fertilizers and modern machinery, however, the necessity for directing the activities of the farm towards the production of large quantities of animal manure is not so essential as it was. This has been demonstrated by a number of farmers whose stories have been told in the series "Progress in British Farming Systems," edited by Mr. Orwin himself. Again, Mr. Orwin points out that he does not wish to be misunderstood. He wants to suggest that if mixed farming does not pay it must not be assumed that no profitable substitute for it can be found.

Another tradition that is inbred in the theory of British farming is that a rotation of crops is necessary, and also that particular rotations must be followed on particular soils. Indeed, many leases, as Mr. Orwin says, demand that particular rotations should be followed on a farm rented. Two things occur to us at once in considering these covenants. First, most of them have come down to us with little or no change from many years ago; secondly, farmers all over the country take very little notice of them. Mr. Orwin maintains that to seek to dictate how the land is to be farmed by means of a cropping covenant that has been copied in the estate office year after year from old tenancy agreements, is to ignore all that we have learnt, in the last generation or so, about the maintenance of soil fertility, to overlook the new means at our disposal for keeping the land clean by mechanical power, and to fail to appreciate the changed economic conditions that have made many of the old farming practices and farm products inappropriate.

That grass farming is good farming is the last bogey to be dispelled. We are rightly proud of our grass land, but Mr. Orwin suggests that much of the grass land of England is full of stored-up fertility that cannot be cashed except by ploughing and cropping, and that there are thousands of

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acres of grass land that would be more profitable, to landlord and tenant alike, under a system of alternate husbandry. The work of Professor Stapledon in Wales has long passed the experimental stage, and it has proved conclusively that the productivity of much of the land now under permanent grass could be increased by ploughing, cropping and re-seeding from time to time.

So he admits that the answer to the question "what is good farming?" is not provided by any of these four. For himself, he feels that the resources of modern scientific and technical knowledge, expressed in the cheap fertilizers and the cheap power now available to the farmer, and the changes in the economic situation—due, on the one hand, to the position of Britain as the principal market for the world's surplus agricultural production, and, on the other hand, to the assistance now being given by the Government to certain forms of home production by the marketing schemes, by subsidies, and by import duties and restriction—have changed the whole position on the land. To-day it is so flexible that it is impossible to define good farming by reference to practices that may have been perfectly sound even a few years ago; and the answer to the question he provides is: "Good farming is not necessarily high farming, nor mixed farming, nor farming to a prescribed rotation, nor preserving grass land. It is any farming which maintains the cleanliness and the fertility of the land while enabling the farmer to pay his labour, to pay his rent and get the best possible living for himself." This seems to be sound common sense, and even though, to a few people, it may seem to be almost self-evident, it is worth saying at the end of such an illuminating discussion of the subject.

Precautions Against Boiler Explosions

FROM time to time, steam boilers used for agricultural purposes have exploded with disastrous results; and in view of the increasing use of steam-raising plant on dairy farms, it is essential that precautions should be taken to ensure that steam boilers are maintained in proper condition for efficient service and that they are worked in a safe way.

The Boiler Explosions Acts, 1882 and 1890, make provision for investigation by the Board of Trade of all explosions of boilers, whether portable or stationary, that occur in this country; while the Factory and Workshop Act,

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1901, requires that every steam boiler used for generating steam in a factory or workshop, or in any place to which any of the provisions of the Factory and Workshop Act apply, shall be examined thoroughly by a competent person at least once in every fourteen months. Dairies in which the manufacture of butter, cream, cheese and ice cream and the sterilizing, homogenizing or pasteurizing of milk are carried on are regarded as coming within the provisions of the Factory and Workshop Act.

The owner or user of a steam boiler installed on farm premises, or taken to a farm for temporary service, should not fail to adopt the following precautions :

(1) The boiler should be of safe construction and constantly maintained in a safe condition.

(2) The boiler should be provided with the necessary fittings of satisfactory design for safe service—e.g., safety valve, water and steam pressure gauges—which should be properly maintained.

(3) The boiler, including all the safety fittings, should be thoroughly inspected both when standing and when under steam at sufficiently frequent intervals by a competent person, who should state in writing the condition of the boiler as revealed by the inspection, the safe working pressure for the ensuing period till the next inspection, the repairs (if any) necessary and the period within which they must be completed. If the boiler is unfit to be put into service again or until specific repairs are carried out, the inspector should so report.

Farmers are strongly advised to follow the now almost universal practice of factory occupiers, viz., to insure their steam boilers with a reputable boiler insurance company; such a company employing trained inspectors to make the necessary thorough examinations and to furnish reports.

It must be emphasized that boilers should, in no circumstances, be left in the care of a young and inexperienced person; and the safe working of a steam boiler cannot be assured unless a trained, intelligent workman is placed in charge of it. Farmers who have the opportunity would find it well worth while to visit, and to arrange for their workmen concerned to visit, the Home Office Industrial Museum, Horseferry Road, Westminster, London, S.W.1, where the exhibits, designed to show the different methods by which safety of machinery, etc., is secured, include a special section dealing with the working of boilers.

Poisoning of Fish by Derris

THE Ministry desires to draw the attention of farmers, fruit growers and others to the poisoning of fish which may be attributable to the presence in rivers or streams of solutions or

NOTES FOR THE MONTH

powders containing derris root or rotenone or any preparation made from derris root.

Derris preparations are now used extensively in agriculture and horticulture. Under the Warble Fly (Dressing of Cattle) Order of 1936, derris dressings are prescribed for the treatment of cattle infested with warble fly; and derris preparations are also in use as insecticides for the control of certain insect pests of fruit and vegetable crops.

When using derris preparations, care should be taken to prevent any of the solution or powder entering rivers or streams containing fish. The practice of the washing, or the indiscriminate dumping, of containers of derris preparations in rivers or streams is to be strongly condemned. The Ministry accordingly appeals to all users of derris insecticides to take every possible precaution to prevent the poisoning of freshwater fish from this cause.

Capital Grant to the University College of Wales, Aberystwyth

TREASURY authority has been obtained for a grant not exceeding £15,000, on a £ for £ basis, for the erection and equipment of a new agricultural research building for the Welsh Plant Breeding Station and the College Advisory Department of Agricultural Economics.

The College proposes to transfer a number of departments, together with the Great Hall and administrative headquarters, to a freehold site on the outskirts of Aberystwyth and close to the National Library of Wales. The erection of new buildings will be carried out in the order determined by the urgency of the need for new accommodation, and on this basis the College Council has placed the agricultural research block first on the list.

The Agricultural Buildings, in which the Welsh Plant Breeding Station and the Agricultural Economics Advisory Department are now housed, were first occupied in 1922, but, owing to the expansion of the work of the departments concerned, these buildings are extremely overcrowded and are also unsatisfactory in other respects. Apart from the provision of adequate accommodation, the transfer of the Station to the new site will have the advantage of bringing it into proximity with the experimental gardens, and also much closer to the College Farm at Frongoch.

The new building, designed by Mr. Percy Thomas, O.B.E.,

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the President of the Royal Institute of British Architects, will be the first instalment of the well-conceived and finely-situated buildings for the University College of Wales. It will comprise office, laboratory and library accommodation, conference room, herbarium, etc., and is estimated to cost about £26,000, to which must be added about £4,000 for approach and site works and the necessary equipment. In view of the close connexion between the work of the Welsh Plant Breeding Station and that of the Imperial Bureau of Plant Genetics (Herbage Plants), it is intended to arrange for the accommodation of the Bureau in the new building.

It is hoped to complete the building in time for the Fourth International Grassland Congress, which will be held in Aberystwyth in July, 1937, under the Chairmanship of Professor R. G. Stapledon, C.B.E., the Director of the Welsh Plant Breeding Station.

Cereals for Autumn Sowing

THE following note has been communicated by the National Institute of Agricultural Botany, Huntingdon Road, Cambridge:—

By the careful choice of suitable varieties of cereals, the farmer should be able to add materially to his returns. For the last fifteen years, the National Institute of Agricultural Botany has conducted systematic field trials with the more promising varieties, and is able to give reliable advice to farmers in the North Midlands, Midlands, South and East of England on the choice of varieties of wheat, barley and oats.

No one variety of any cereal succeeds equally well everywhere; its suitability for conditions of high, moderate or low fertility must be taken into account. In addition to yield and quality of grain, it is frequently important to consider length of straw and its resistance to lodging, and such points as winter hardiness, time of ripening and disease resistance.

Farmers have a wide range of good winter wheats from which to choose, among the best of them being Victor, Wilhelmina, Juliana, Yeoman, Yeoman II, Holdfast, Little Joss, Steel, Rivett and Squarehead's Master or Standard Red.

As regards choice of barley, where winter hardiness is of first importance, the ordinary six-row winter is most satisfactory. Under favourable conditions, Plumage-Archer or Spratt-Archer both withstand normal winters and give good malting samples as well as high yields.

NOTES FOR THE MONTH

Among winter oats, Grey Winter and Black Winter are the most hardy. On richer soils, Bountiful stands better but is not so hardy. Where extreme winter hardiness is not required, and for very fertile soils, Resistance can be recommended on account of its resistance to lodging, good quality straw and very high yields. The use of the term "White Winter" as a varietal name for oats should be avoided, as it is ambiguous.

Brief particulars of the purposes for which the above varieties are adapted are given in Farmers' Leaflet No. 1, copies of which can be obtained free of charge from the Institute, as above, or from any County Agricultural Organizer; and inquiries about these or other varieties are always welcome.

Agricultural Research Scholarships and Studentships

ON the recommendation of the Agricultural Research Council, post graduate Scholarships, tenable from October 1, 1936, have been awarded by the Ministry as follows:—

Three-year Scholarships :—

R. Brown	..	..	..	(Botany)
R. A. Webb	..	..	..	(Mycology)
G. P. Wiberley	(Agricultural Economics)

One-year Scholarship :—

I. W. Selman	(Physiology)
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No Studentships for Research in Animal Health were awarded this year to applicants from England and Wales, but the Studentship awarded to H. Wilkinson in 1934 has been renewed for a further period of four years from October 1, 1936, to enable him to take a course of study at a Veterinary College for the diploma of M.R.C.V.S.

These awards are made with the object of training research workers, and thus to advance agricultural science and scientific studies bearing on animal health.

National Dairy and Ice Cream Convention

THE National Dairy and Ice Cream Convention will take place at the Crystal Palace from January 26 to 29 next. Plans for the exhibition to be held in connexion with this Convention have now been issued, and show an increase of 9,372 square feet in exhibition space over that provided at the last exhibition. Already more than three-quarters of the space has been allotted, and it is anticipated that there will be a record attendance at the Convention. Further particulars may be obtained on application to the Organizer, National Dairy and Ice Cream Convention, 8 Mitre Court Chambers, London, E.C.4.

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Diseases of Animals in 1935

THE Report of Proceedings under the Diseases of Animals Acts for the year 1935, recently issued,* opens with a reference to the enactment of the Diseases of Animals Act, 1935, which makes provision for the application of the existing Acts to poultry, and confers powers upon the Ministry for the regulation of the manufacture and importation of therapeutic substances intended to be used solely for veterinary purposes. A general indication of the principles that will govern the exercise of the new powers is given in Part I of the Report. Part II describes the position of Great Britain with regard to the twelve notifiable diseases and records its continued freedom from cattle plague, pleuro-pneumonia, sheep pox, rabies, epizootic lymphangitis, glanders and dourine.

The number of outbreaks of foot-and-mouth disease was 56, distributed among 13 centres involving 9 English counties, one Welsh and one Scottish county. Scotland had previously been entirely free from the disease for $3\frac{1}{2}$ years. Outbreaks of this disease continue to be dealt with by what is known as the slaughter policy.

A substantial reduction (30.3 per cent.) in the incidence of sheep scab is recorded as the result of the intensive measures of the past two years. There was also a decrease (2.3 per cent.) in the number of outbreaks of anthrax, and a further decline (13.9 per cent.) in the number of outbreaks of parasitic mange in horses. On the other hand, the number of outbreaks of swine fever increased by 11.8 per cent. as compared with 1934.

Details are given as usual to show the results of the administration of the Tuberculosis Order of 1925 by Local Authorities. The number of cattle examined by veterinary inspectors was 415,667 on 25,032 farm premises as against 393,343 cattle in 1934, and the number of cattle actually slaughtered under the provisions of the Order, further increased by 228 to 22,237. This part of the Report describes the institution of the Tuberculosis (Attested Herds) Scheme made under Section 9 of the Milk Act, 1934, and the difficulties that have accounted for the slow progress of the Scheme.

* Report of Proceedings under the Diseases of Animals Acts for the Year 1935: H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price net. 2s. (postage 2s. 2d.).

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Part III of the Report describes the measures taken to prevent the introduction and spread of disease in this country. The only instances of a scheduled disease found amongst imported animals were 54 cases of sheep scab—22 from Northern Ireland and 32 from the Irish Free State.

Part IV describes the administration of the measures for the protection of animals and poultry from unnecessary suffering during transit by sea, rail or road. The records show that the percentage of casualties among the large number of animals carried by sea continues to be negligible.

Part V deals with the certification of exported pedigree and other livestock and raw animal products to comply with the regulations of the importing countries, where it is required that such certification must be made under the Ministry's authority. Particulars of the working of the London Quarantine Station are included.

Part VI is a miscellaneous section that includes a reference to the annual Meeting of the International Veterinary Bureau in Paris and a description of the Warble Fly (Dressing of Cattle) Order of 1926 and of the circumstances that led up to its issue.

The volume includes a separate report by the Director of the Ministry's Veterinary Laboratory and Research Institute at Weybridge, reviewing the diagnostic and research work carried out at that institution.

The Appendixes to the Report contain the usual statistics as to scheduled animal diseases confirmed in each county in Great Britain, the livestock population, animals imported and exported, numbers and breeds of stock exported with the Ministry's certificates, and the incidence of certain animal diseases in European countries. Full particulars of the Ministry's Attested Herds Scheme are also included.

World's Dairy Congress, 1937

It is announced that the Eleventh World's Dairy Congress will be held in Berlin from August 22-28, 1937. The Congress will be divided into several sections for the purpose of discussion and the reading of papers on various aspects of the milk industry.

During the period of the Congress there will be held an International Dairy Exhibition, at which opportunity will be given to countries to demonstrate their outstanding improvement in marketing and in the treatment and processing of

NOTES FOR THE MONTH

milk. There will also be held an international competition for dairy products and an international dairy-machinery exhibit.

Arrangements for the representation of the dairying industry in this country, at the Congress, are in the hands of the British Dairy Farmers' Association. Full information may be obtained on application to the Secretary, British Dairy Farmers' Association, 28, Russell Square, London, W.C.1.

Sampling Observations on Wheat, 1935-1936 : Report for Fourth Quarter

THE results of the fourth year's sampling observations on wheat are of special interest, as the weather conditions have been entirely unlike those of the last three years.

The full table of observations taken in the fourth quarter is presented in the customary form in Table II. The mean yields of the two standard varieties grown at each station are given in Table I, which also shows the means of the yields obtained at each station over the previous three years, and the predictions of the yields for 1936 from the shoot heights at ear emergence and plant numbers at tillering. The

TABLE I.—OBSERVED AND PREDICTED YIELDS

	Mean 1933-35	1936	Predicted 1936	Observed <i>less</i> Predicted
Seale-Hayne	25.9	23.1*	26.0	-2.9
Rothamsted	29.7	31.8	30.9	+0.9
Newport	39.7	32.2*	(44.2)	—
Boghall	32.7	28.4	21.3	+7.1
Sprowston	24.7	21.4*	30.0	-8.6
Plumpton	39.4†	22.6*	31.4	-8.8
Mean	32.0	26.6		-2.5
Wye	24.6	20.8	21.5	-0.7
Long Sutton	20.5†	27.4	—	—
Woburn	25.1	21.3	27.4	-6.1
Cirencester	30.0†	24.1	25.6	-1.5
Mean of all	29.2	25.3		-2.6

* July and August damage reported by observer.

† Plumpton and Long Sutton are means of two years and Cirencester of one year only. In each case the means are adjusted so as to be comparable with those of the other stations over the same set of years.

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TABLE II.—SAMPLING OBSERVATIONS ON WHEAT, 1935-36, FOURTH QUARTER

Station	Variety	Last observations before harvest.		Date fit for cutting	Date of harvest	Distance between rows in.	Yields and standard errors of differences in cwt. per acre.		
		Date	Ear Density per 32m.	Ear height cm.			Grain	S.E. of diff.	Straw
CIRENCESTER, Gloucestershire ..	S.H.M.* ..	Aug. 7	1,391	96.9	Aug. 12	6.0	23.6	± 1.39	42.6
	Yeoman ..	Aug. 7	1,459	87.3	Aug. 12	6.0	24.6	± 1.39	37.9
	Victor ..	Aug. 7	1,249	86.9	Aug. 12	6.0	23.3	± 1.39	40.0
LONG SUTTON, Hampshire ..	S.H.M.* ..	Aug. 8	—	105.1	Aug. 10	7.0	26.9	± 1.02	40.0
	Yeoman ..	Aug. 8	—	103.8	Aug. 10	7.0	27.8	± 1.02	40.2
SPROWTON, Norfolk ..	S.H.M.* ..	Aug. 10	1,363	109.1	Aug. 14	6.75	22.8	± 1.76	29.6
	Yeoman ..	Aug. 10	1,359	94.2	Aug. 14	6.75	19.9	± 1.76	26.5
WOBURN, Bedfordshire ..	S.H.M.* ..	Aug. 17	1,596	111.8	Aug. 17	7.8	18.3	± 1.49	54.3
	Yeoman ..	Aug. 17	1,679	104.6	Aug. 17	7.8	24.3	± 1.49	53.2
SEALE-HAYNE, Devonshire ..	S.H.M.* ..	Aug. 4	1,764	106.5	Aug. 9	7.0	23.8	± 1.28	45.0
	Garton's No. 60	Aug. 4	1,759	95.0	Aug. 11	7.0	26.0	± 1.28	47.0
ROTHAMSTED, Hertfordshire ..	S.H.M.* ..	Aug. 10	1,438	109.6	Aug. 15	6.0	31.3	± 1.65	58.2
	Yeoman ..	Aug. 10	1,788	100.9	Aug. 15	6.0	32.3	± 1.65	61.9
NEWPORT, Shropshire ..	S.H.M.* ..	Aug. 26	—	128.3	Aug. 24	6.0	34.9	± 2.51	67.5
	Yeoman ..	Aug. 26	—	119.1	Aug. 26	6.0	29.6	± 2.51	68.5
PILMPTON, Sussex ..	S.H.M.* ..	Aug. 17	1,055	100.7	Aug. 16	7.0	21.1	± 1.71	22.4
	Yeoman ..	Aug. 17	1,306	93.4	Aug. 16	7.0	24.0	± 1.71	24.9
BOGHALL, Edinburgh ..	S.H.M.* ..	Sept. 9	1,077	100.0	Sept. 10	6.0	28.8	± 1.73	56.8
	Yeoman ..	Sept. 9	1,347	93.0	Sept. 14	6.0	28.1	± 1.73	51.7
WYE, Kent ..	S.H.M.* ..	Aug. 8	1,408	86.6	Aug. 8	7.0	22.0	± 1.92	32.9
	Yeoman ..	Aug. 8	1,448	77.9	Aug. 10	7.0	19.6	± 1.92	30.3

* Squarehead's Master.

† Both varieties slightly unripe at harvest.

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relations found to hold between these three quantities in the first three years were described in the May number of this JOURNAL.

The table presents several interesting features. The mean yield over all stations, 25.3 cwt. per acre of undressed grain, though substantially below the mean of the three previous years, namely 29.2 cwt., cannot be taken as indicating a disastrous crop failure. For the first six stations shown in the table, which are those that have distinctly less variability in yield from year to year than the other four, the drop from 32.0 to 26.6 cwt. is somewhat greater. The lower mean yield this year, however, has not been caused by partial or complete crop failure at a few of the stations, but by the absence of any outstanding yields such as were a feature of the last three years. Only at Long Sutton and Rothamsted have the yields this year exceeded the means over the previous three years.

One of the most remarkable yields is that of Newport. This station was singularly unfortunate, because weather conditions delayed sowing till the end of November and continued so bad that the wheat did not appear above ground till the end of January. An exceptionally poor stand was obtained, the plant number at tillering being only 390, as compared with a mean of about 1,250 for all stations in 1933-5. The crop came on remarkably, however, tillering being so vigorous that the maximum number of shoots was of the order of 2,250, dropping to 1,400 at ear emergence. At the beginning of July the plots looked very promising, and, in spite of serious damage owing to the wet weather and

TABLE III.—DRY MATTER OBSERVATIONS

Station and Variety	Dry Matter		Dry Matter		Dry Matter		Yield	
	(cwt. per acre)	Per cent	(cwt. per acre)	Per cent.	(cwt. per acre)	Per cent.	cwt. per acre	
							Grain	Straw
NEWPORT	July 14		July 27		Aug. 10		Aug. 26	
S.H.M.* ..	68.0	31.7	80.6	39.5	82.4	46.0	34.9	67.5
Yeoman ..	57.8	30.1	76.0	37.4	77.9	44.4	29.6	68.5
S.E. of Diff. ..	±3.93	±0.594	±6.58	±0.666	±4.22	±0.604	—	—
ROTHAMSTED	July 13-14		July 27-29				Aug. 17	
S.H.M. ..	67.2	36.2	72.6	42.7	—	—	31.3	58.2
Yeoman ..	56.5	36.8	70.3	43.7	—	—	32.3	61.5
Victor ..	58.0	35.0	76.0	41.6	—	—	36.4	62.4
S.E. of Diff. ..	±3.68	±0.649	±3.41	±0.530	—	—	—	—

* Squarehead's Master.

NOTES FOR THE MONTH

TABLE IV.—OBSERVERS' REPORTS AT HARVEST

Seale-Hayne	..	"Crop laid in parts. Rabbit and bird damage reduce yield considerably."
Rothamsted	..	"All varieties partially lodged, but not enough to effect yield seriously."
Newport	..	"The yield of Yeoman seriously reduced owing to large number of shrivelled grains which . . . may be due to a host of factors. S.H.M. also slightly affected."
Boghall	..	No remarks.
Sprowston	..	"Some lodging on all plots, but very pronounced on S.H.M. in block A. Lodging more severe on S.H.M. than on Yeoman."
Plumpton	..	"Knocked about badly by the bad weather of July. Rather heavily attacked by sparrows. Yeoman rather badly attacked by smut."
Wye	..	No remarks.
Long Sutton	..	No remarks.
Woburn	....	"Not quite ripe. About 10 per cent. bird damage in July on S.H.M."
Cirencester	..	"Yeoman not quite so ripe as S.H.M. and Victor."

attendant pests in July, the highest yield of any station was obtained.

The predicted yields are, on the average, somewhat above those realized, and, at first sight, it would appear that the relations observed in previous years have not been repeated under the altered weather conditions of this season. On examination, however, it will be seen that, with the exception of Woburn (which reported slight bird damage and is believed to give yields low compared with prediction in all years), all the large deficiencies are at stations at which serious July damage was reported by the observers. (The harvest reports of all observers are given in Table IV.) Although no exact estimates of this damage are available, it is reasonable, from the remarks of the observers, to suppose that it was of the order of 5-10 cwt. per acre. Newport is outside the range of the prediction formula (owing to the very low plant number referred to above), but even here the predicted yield, bearing in mind the July damage, is surprisingly near that observed. A prediction made in June cannot, of course, be expected to foretell damage occurring in July. The Scottish station, Boghall, has given a yield substantially higher than that predicted.

The results of this year, therefore, taken as a whole, are a remarkable illustration of the recuperative powers of the wheat crop, and its adaptability to varied weather conditions. Were it not for the exceptionally wet July, it seems probable that the mean crop would have been but little below the average.

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Another striking effect of the unseasonable weather this summer is the lateness of the harvest. Excluding Boghall, the mean date of harvest this year, August 15, is ten days later than last year, and twelve days later than 1934. Boghall was not harvested this year till September 10-14, over a fortnight later than usual.

An additional locally-chosen variety was grown at three stations this year. Victor at Rothamsted and Garton's No. 60 at Seale-Hayne both yielded about 15 per cent. above the mean of the standard varieties. At Cirencester, Victor gave about the same yield as the standard varieties. Yeoman has done significantly better than Squarehead's Master at Woburn, while the reverse is the case at Newport, but, on the average, there is little difference in yield between the two standard varieties.

Dry matter samples were again taken by Rothamsted and Newport. The accompanying table (Table III) shows the results of these observations.

Agricultural Careers

A USEFUL pamphlet* giving advice and information on the subject of agricultural careers, has just been compiled by the Ministry of Labour in collaboration with the Incorporated Associations of Headmasters and Headmistresses of Public Secondary Schools. The pamphlet deals primarily with general agriculture, but also includes information on dairying, horticulture, poultry husbandry and forestry. Detailed reference is made to the educational facilities provided or supervised by the Ministry of Agriculture, and to the qualifications necessary for a successful agriculturist. The chief opportunities in the industry are stated to consist in independent farming (including dairying and poultry husbandry) and horticulture; in salaried work on the land; in commercial farms at home and abroad; on the staffs of Government Departments at home and abroad; on the staffs of local authorities; in teaching appointments; and in research work. A section is devoted to each of these branches, the prospects and possibilities being stated in a clear and authoritative manner that should prove helpful to boys and girls, parents, teachers, and all who are concerned in advising children from public and secondary schools in the choice of an agricultural career.

* *Agriculture, Horticulture and Forestry: Choice of a Career Series*, No. 25. Pp. 20. Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 4d., post free 5d.

OUR CHANGING AGRICULTURE :

THE DISTRIBUTION OF ARABLE LAND IN THE ADUR BASIN, SUSSEX, FROM 1780 TO 1931.

H. C. K. HENDERSON, M.A., B.Sc., PH.D.

WHEN making a particular study of the Adur Basin, the writer found occasion to go out into the field and map the crop distributions on six-inch maps. From this record he constructed Map I, showing the actual field distribution of ploughland in 1931. This map brings out several interesting features, particularly the three-fold division of the Basin from an agricultural point of view into a Coastal, a Downland, and a Wealden zone, with the somewhat patchy aspect of the first two, and the belted distribution of the third. The extent of building in the Coastal zone is an obvious reason for a patchy distribution there, since houses necessitate the absence of cultivation. For example, at Worthing, there are two quite separate areas of ploughland on the east and the west of that town; similarly, the cultivation does not extend so far eastwards as does the Coastal Plain, because of the westward spread of Hove. The absence of arable land to the west of Shoreham is due, however, to different causes: in the first place, this is an area of alluvium, fine in texture, subject to sea-flooding in places and therefore in part consisting of saltings, and secondly, a considerable acreage is occupied by Shoreham aerodrome, which has been enlarged and opened as the Brighton and Worthing Airport in the present year.

The surface known geologically as the " Brickearth " has been so largely built over that the percentage of arable land (14.6) fails to reflect adequately the qualities of its soils; on the Marine Gravel 42 per cent., and on the Coombe Deposits (or Shrave) 29 per cent. was under the plough in 1931. The total proportion of the Coastal Plain arable was 35 per cent., a remarkably high figure having regard to the extent of land built over.

The arable land in the Downland zone is found to lie either in the lower portions of the southward facing valleys or on the flanks of the river gap of the Adur; the arable area is, as a rule, below the 300-foot contour, very little being above 450 ft. O.D. The soils of the hill-tops are notoriously thin, those of the valley floors deep and loamy; this offers one explanation of the distribution of arable land, but a further reason for

OUR CHANGING AGRICULTURE: THE ADUR BASIN

the prominence of the valleys appears to be the shelter they afford from the prevalent south-westerly winds. Another influence is undoubtedly accessibility, for the spread of ploughland through the Downland zone is found only on the lines of the through routes of the Worthing-London, the Brighton-London and the Brighton-Lewes roads.

In all, the Downland zone had 8,515 acres under the plough in 1931, of which total 7,504 acres were on the Upper Chalk, 810 acres on the Middle Chalk, and 201 on the Clay-with-Flint soils; proportionate to the areas of these soils the arable land represents 19.5 per cent. of the Middle Chalk, 17.1 per cent. of the Upper Chalk, and only 9.3 per cent. of the Clay-with-Flints, while the total figure is equivalent to only 17.0 per cent. of the Downland zone, taken as a whole.

In the Weald, at first glance, the arable land appears more evenly distributed, but closer inspection of the map shows that at its southern edge there are two narrow arable belts separated from each other by a much wider zone almost completely devoid of ploughland. The former of these two arable belts lies on the soils of the Lower Chalk and Upper Greensand platform,* a platform which, in this part of the country, is very narrow. The zone of unploughed land lies on the heavy clay soils of the Gault, upon which the 1931 crop survey shows a mere 73 acres of arable. The second belt of ploughland is on the geological outcrop known as the Hythe Beds, that is to say the lowest and oldest of the three divisions of the Lower Greensand, yielding soils that are loamy in texture and well supplied with plant food. The other two divisions of the Lower Greensand are both relatively infertile, the younger Folkestone Beds yielding a very light soil described by Topley† as "a loose sand which can be vastly improved by marling from the Middle Gault"; on these there is a certain amount of arable land, but the intermediate Sandgate Beds consist of clay soils that are ploughed only where they lie within the boundaries of a field in which the soils are mostly Hythe.

To the north of this narrowly-zoned area lies a wide belt of Weald Clay soils, which include certain sandy belts

(*) Owing to a geological flexure, these scarp-foot beds run to the north-west from Poynings to Henfield, and then reassume a west-east strike.

(†) W. Topley, *Agricultural Geology of the Weald*, *J. R. Agric. Soc.*, Vol. 8, Sec. 2, 1872.

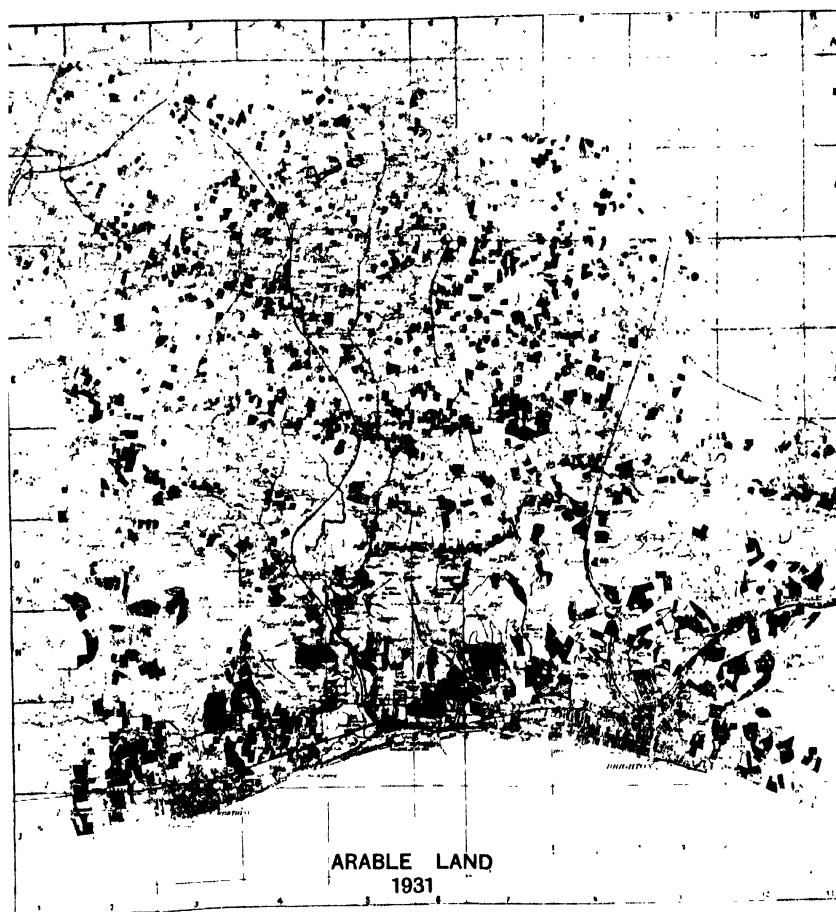


Photo. Dr. Henderson.

MAP. No. I.— Actual field distribution of ploughland in the Adur Basin, Sussex, in 1931.

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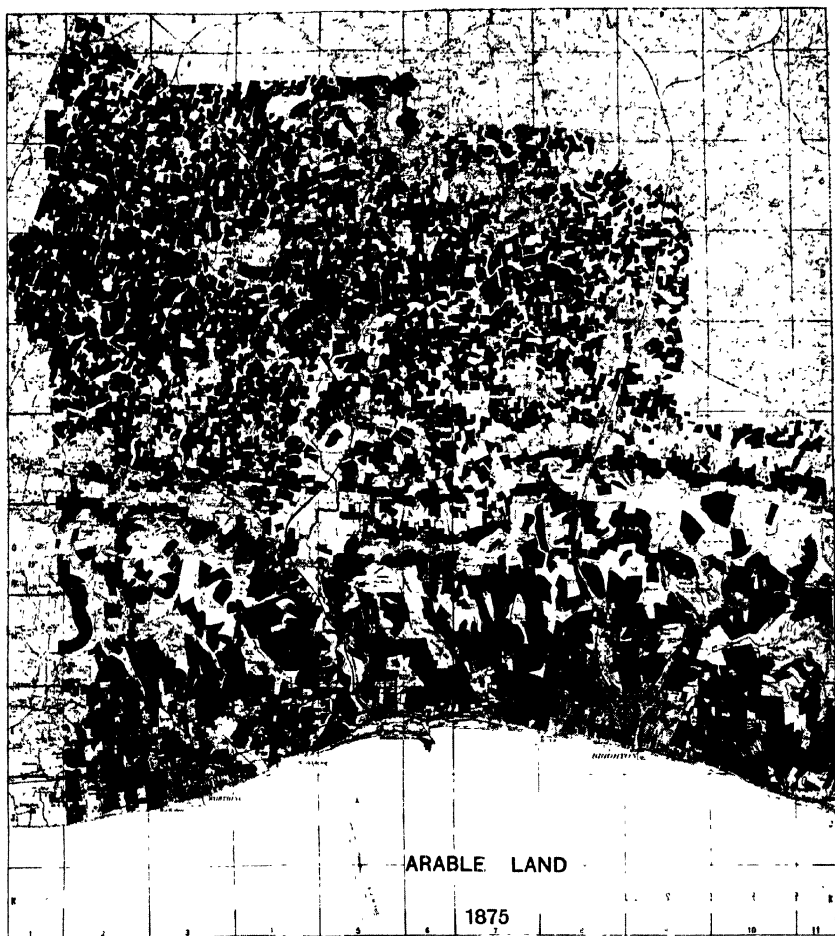
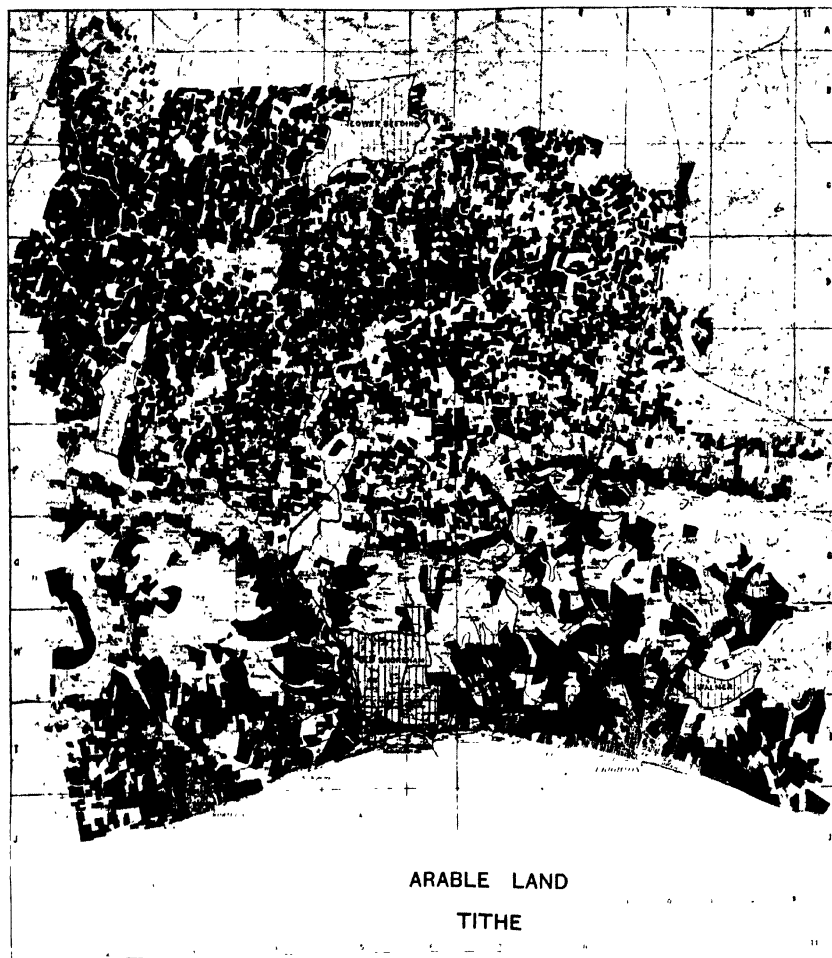


Photo. Dr. Henderson.

MAP No. II Distribution of arable land in the Adur Basin, Sussex, in 1875



MAP No. III. Distribution of arable land (Tithe) in the Adur Basin, Sussex records between 1837 and 1850

Photo Dr. Henderson

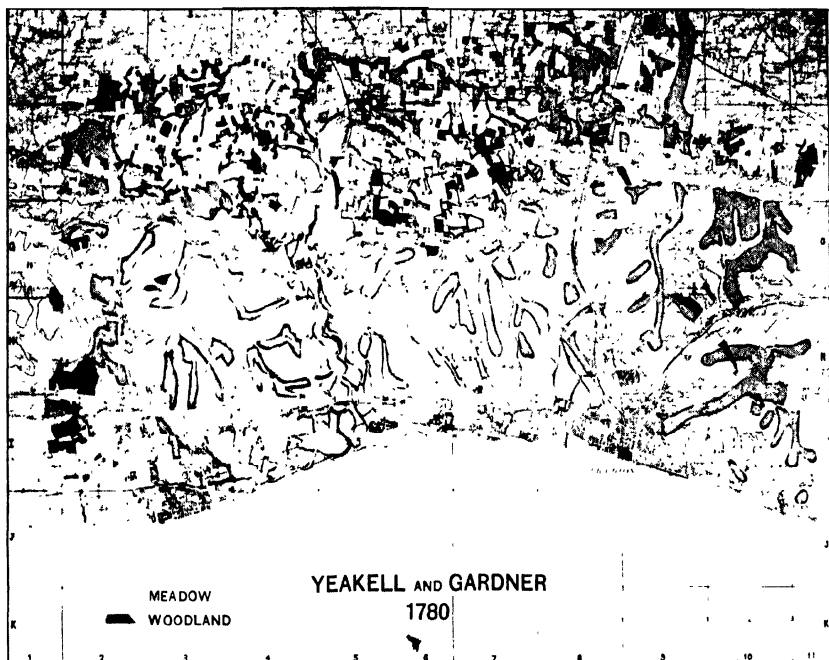


Photo Dr. Henderson.

MAP No. IV. Land in the Adur Basin, Sussex, indicated by Yeakell and Gardner (1780) as being other than arable land.

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described originally by P. J. Martin in his "Geological Memoir of a part of Western Sussex," published in 1828. One of these sandy belts makes itself very evident on the 1931 map as a line of arable land running from Coneyhurst Common (C.2) to Twineham (D.6). On the Weald Clay proper there is very little ploughland at all in the western part of the area surveyed, but, towards the east, where the outcrop becomes narrower, it achieves a very reasonable proportion for a type of clay soil which, in most parts, becomes adhesive in wet weather and cracks badly in periods of drought, such as have occurred in the last three summers, 1933-34-35. North of this clay zone lies an area of somewhat higher land, composed of Tunbridge Wells Sands, the soils on which are light sandy loams, deficient in plant food and bearing a large amount of woodland. Most of the small amount of arable land on the Tunbridge Wells Beds lies on the Cuckfield Clay or the Grinstead Clay, both of which occur in very small patches and give lower relief, with the result that they are improved by downwash from the surrounding sands.

This method of going out into the field and recording agricultural distributions is not, of course, new, but, until recently, no maps have been produced from the records. Having duly collected the information and reduced to a scale of one inch to the mile, the writer decided to examine to what extent these modern distributions were paralleled in the past. The eighteenth-century reports published shortly after the foundation of the old Board of Agriculture, while giving useful written accounts for each individual county, included no maps of the actual distribution of crops or land utilization. Besides these, there are the valuable reports on various counties in the *Journal of the Royal Agricultural Society*, but these again make no attempt to show any actual distributions. There are, however, two very important sources of information of the type required: firstly, the records made following the Act of 1836 in connexion with the commutation of tithes, a record unfortunately incomplete, because so many parishes were not tithable for one reason or another, and hence the expense of a survey of them was not justified; secondly, the First Edition of the 25-Inch Plans of the country, published by the Ordnance Survey in the seventies and eighties of last century, had the field acreages recorded in so-called "area-books," instead of having them printed on the maps themselves, as is done in the later editions; while, in

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addition to the acreages, the earlier books quoted the land use of each field. After a time, the Ordnance Survey decided that to include the latter information was making the cost too high, and so this record also is not complete for the country. Indeed, the most complete mapped or mapable record of land utilization in this country is the modern Land Utilization Survey, carried out under the Directorship of Dr. L. Dudley Stamp.

The writer was more fortunate than many workers would be in that the whole of the Adur Basin was fully recorded in the Ordnance Survey area-books in 1875, and only six parishes were not completely surveyed for tithe purposes. There was actually only one parish that was entirely unsurveyed for tithe, but in the others either the record was of no use or a portion of the parish was not tithable.

The records of 1875 are very near to the peak period of arable land acreage in this country, and can therefore be assumed to show the maximum of ploughland in the history of the area. This record (Map II) shows that, despite the much greater amount of arable land in the region as a whole, the areas outstanding in 1931 were also prominent in 1875: thus, in the Coastal Plain region the soils, other than the alluvium, are arable except where buildings have spread over them. The alluvial flats at the mouth of the Adur provide one contrast in that good drainage has been secured, and most of the area covered by poor grassland or by Shoreham aerodrome in 1931, was under the plough in 1875. In the Downland region, while the factors of accessibility and shelter are still evident, the arable land spreads much farther up the valleys, and even over considerable areas of the plateau top. In the Wealden region, the southern soil belt-ing is again evident on this map, and the actual density of arable land on the Lower Chalk—Upper Greensand platform, and on the belt of Hythe Bed soils, is considerably higher than in 1931, so that these two belts still stand out as being particularly fertile despite the general tendency towards a much higher density on all soils. The dividing belt of Gault Clays is almost as negative as in 1931, the only portion that has many acres of arable land lying in the centre of the belt, between the Adur and Poynings (G.7). The Folkestone Beds carry a little more ploughland than in 1931, but the negative character of the very narrow belt of Sandgate Clays is striking, especially in the west of the region. The Weald

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Clay soils provide the outstanding feature of this map, for, in direct contrast to the evidence in 1931, these soils were extensively under the plough. What is more interesting is the fact that the western part is almost continuously arable, whereas on the modern map this appears as the least arable area of the Weald Clay soils.

A mere glance at the 1875 map gives the impression that the density of arable land increases very considerably westwards, while exactly the opposite impression is obtained from the modern map. The explanation appears to be that, in the latter half of last century, before the bulk import of overseas grain became possible, it was necessary to plough as much land as possible, and the clay soils were improved by means of drainage. The agricultural journals indicate this by the number of papers published on the subject, but land drainage at any time is a costly business, and the increase in agricultural wages, out of all proportion to any change in prices, has resulted in a smaller sum being available for such maintenance of drains as is essential, and hence they have gradually deteriorated and eventually become derelict. As a consequence, the land first became pasture and later on, in many instances, was allowed to revert either to poor quality grazing or even to woodland; a number of cases of the latter type of reversion are to be found in the region at present under discussion. The eastern part of these Weald Clay soils has been quoted as being the more sandy, and hence (as it needs less drainage) the relatively small change between 1875 and 1931. The small portion of Tunbridge Wells Sands occurring in this region, though bearing more arable land than in 1931, again appears as a relatively infertile area.

Turning to Map III (Tithe), the incomplete nature of the data, of which the dates of recording vary from parish to parish between 1837 and 1856, means that the picture is not quite complete, but the proportion of the area lacking records is relatively small, and is so distributed that there is no serious deficiency of information in any one of the regional units within the Adur Basin. As to the variation in dates, most of the parishes were surveyed by 1845, after which year only eight parishes had not settled their disputes; there were only two dated as late as 1851, and one 1856.

The actual distribution of arable land is shown to have been rather less dense than in 1875, but throughout the Basin it was far denser than at the present time. On the Coastal

Plain, the smaller extent of the towns of Worthing and Brighton is apparent, as evidenced by the smaller area of non-arable land; the alluvium near the mouth of the river was under the plough, as it was down to 1875; and the plain again stands out as a zone with much more arable land than the Downland region to the north. On the Downs, the difference between 1875 and the Tithe map is very marked, and in general the southern half of the belt of Downland has a much greater proportion of its area under the plough than the northern portion. The ploughland spreads farther on to the Downs behind Brighton than elsewhere, and the concentration of arable land in the gaps and southward opening valleys is just as evident as at the other dates. In the zone of narrow geological outcrops at the foot of the Chalk scarp, the distribution is almost exactly similar to that on the 1875 map, with the exception that there is more arable land on the Gault on this map than at any other date. As on the other maps, there is a narrow belt of non-arable land along the southern edge of the Weald Clay, where the spring line along the junction of the Hythe Beds and the Weald Clay occurs; but, on the whole, there is a considerably greater area of arable land on this outcrop at this period than in 1875; the western portion of the Weald Clay soils stands out as being almost entirely under the plough. This degree of cultivation is the more surprising since, in addition to the clayey nature of the soil, this is the part of the zone which, then as now, is cursed with the "shaws" or tree-hedges to which all agricultural writers refer in such scathing terms. These shaws serve merely as hedges between fields, but are allowed to include trees of no mean size and are often anything between ten and twenty yards wide; the resultant lack of sunlight, both for plant growth and for evaporation of surface water, is so serious that it is normal to find, all round the field, a belt several yards wide in which crop yields are very poor.

During the latter half of the eighteenth century, as a result of the offer of a prize, a number of county maps was compiled on a fairly large scale, usually two inches to the mile, and one of these was that by two surveyors, Yeakell and Gardner, of Sussex. Their map of Sussex was to have been published in eight sheets, and was intended to record all land utilization details, as did those of John Rocque, who published similar maps of Surrey and Berkshire, and others; the Sussex map was never completed, and only the four

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southern sheets were published, while the information on these four is by no means complete, as far as the land utilization is concerned. It was found impossible to reconstruct the distribution of arable land for the Adur Basin at this date, therefore, and all that can be recorded, as shown on Map IV, is the land which Yeakell and Gardner have indicated as being other than arable. Even this is incomplete and consequently it is not safe to reason that the remaining land was actually ploughland.

On the Coastal Plain, the most striking feature is the lack of built-over land, e.g., Hove has only seven building symbols; secondly, it is seen that the area of alluvial soils near the mouth of the Adur was not arable in 1780, though it was under the plough both in 1875 and in the forties of last century; the very few and very small fields bearing a meadow symbol in the area to the west of Worthing suggests that this area, on the contrary, has always been of importance as arable land. On the Downs, there is little noticeable difference between this map and that of the Tithe period as far as buildings are concerned. The incomplete nature of the map is brought out, for several areas that do not bear a meadow symbol on this map have not been ploughed at any subsequent date; this supports the statement above, that it is not safe to assume that all land bearing no symbol must have been arable. The map covers only a portion of the Wealden zone, but it is valuable to note that the belt of Lower Chalk and Upper Greensand soils carries very little meadow, while the Gault is essentially meadow or woodland. The Lower Greensand soils bear relatively little meadow and the Weald Clay shows considerably less meadow than in 1931, though not a great deal more than on either of the other maps. Hence, on the whole, the information on Yeakell and Gardner is in keeping with the later and more complete records.

Conclusion. To summarize the evidence on the several maps, the Coastal Plain has been consistently arable at all dates, save for the alluvial soils, which were under the plough at two of the dates (1875 and Tithe), and for areas of normally fertile soils which have been steadily built over during the period under consideration. As to the Downs, it is evident that, at all dates, shelter has been the most important factor influencing the distribution of arable land, and that the

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existence of the gaps is of great importance on grounds of accessibility; a further general tendency on all the maps has been the apparent division of the Downland zone into two belts, a southern one with the bulk of the ploughland, and a northern one with very little ploughland and a considerable amount of hill pasture.

In the Weald, the most striking feature has been the consistently arable utilization of the several narrow belts of soils at the foot of the Chalk scarp, especially the Lower Chalk and the Hythe Bed soils, and the equally consistent absence of ploughland on the Gault soils. By contrast with the clays of Gault, the Weald Clay soils, though bearing little arable land in 1931, have at earlier dates been largely under the plough, chiefly as a result of careful drainage. The latter feature has been emphasized by the fact that the sandier portions, mainly towards the east, have shown less change than the essentially clayey areas in the west of the Adur Basin, where the geological term, clay, is borne out to the full.

It is generally realized that there has been a decline in the amount of land under the plough in most parts of the country. Further, it is accepted that the chief cause of such, is the development of large vessels capable of bulk transport of grain from the newer overseas producers; these producers, given the opportunity for extensive farming, have been able to market wheat, despite their distance from the market, at very low prices relative to the costs of production in this country of intensive agriculture. The net result is, that the more easily worked soils have remained under the plough while the heavier, but not necessarily less fertile soils, have reverted to pasture.

While the Gault Clays have apparently been too heavy for arable cultivation at all dates, the margin of profit was such, in the nineteenth century, as to allow the efficient drainage of clay soils such as those of the Weald. Labour costs have risen some 300 per cent. since the "seventies" of last century but there has been no corresponding increase in farmers' prices, and this has meant a reduction in the amount of money available for the maintenance of drainage systems. While Hall and Russell ("Soils of Kent, Surrey and Sussex," p. 125) claim that Weald Clay soils were never highly farmed, Hawes, in his paper on the Wealden Clay of Sussex (*J. Roy. Agri. Soc.*, Vol. 19, 1858, p. 182) writes: "The Wealden Clay is essentially a wheat soil, and produces handsome crops of it,

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healthy and strong, with bright straw and grain of a quality very superior to that grown on lighter lands; nor where the land is fairly dealt with, is there any deficiency in quantity." Again, in a footnote signed "H. S. Thompson" to an article by Prof. Buckman, entitled "Agricultural Weeds" (*J. Roy. Agri. Soc.*, Vol. XVI, 1856, p. 368) the following statement appears: "I have never yet seen clay thoroughly drained, deeply cultivated and reasonably well farmed, which did not speedily lose the name of *hungry*, and earn the title of *grateful*, clay."

The statistics of a Weald Clay parish (Twineham), obtained from the Ministry of Agriculture, show a decline in yield from 38 bushels to the acre in 1885 to an average figure of 31 bushels for the period 1930-1934. Hence it seems that the key to the decline in ploughed land on the Weald Clay lies in Hawes' explanation of his phrase "fairly dealt with," which he states implies good drainage and liberal manuring; the conclusion, therefore is, that the economic factor of an insufficient profit for the maintenance of drains is the crux of the change on this soil. In general, the whole problem revolves upon the low farmers' prices in recent years, though the factors through which individual cases are affected vary considerably.

While the present paper deals only with the Adur Basin, and, as has been stated, the records are by no means complete for the whole country, this is not the only area being worked upon. The writer has himself already done a considerable amount of the work for a similar study in Derbyshire, and several of his post-graduate students are extending the work in Sussex and southern Surrey, Devonshire, Essex, Hertfordshire, Leicestershire and Wiltshire. The writer hopes that eventually he will have a sufficiently large number of students to map and interpret all the available records. The resultant maps will be reduced to the common scale of one inch to the mile, though the originals can bear photographic reduction to a scale of one-quarter inch to the mile, as is seen with the accompanying illustrations, all of which are approximately on that scale.

Even in its present incomplete state, the carrying out of this work has made heavy demands upon the time and patience of the officials in charge of the relevant documents and maps, both at the Ministry and at the British Museum, and to these the writer wishes to offer his grateful thanks.

HERBS IN THE KITCHEN

AMBROSE HEATH

I HAVE been asked to write a few notes about the uses of herbs in the kitchen, basing them on the Ministry's Bulletin No. 76 on Herbs,* published a short time ago. For many years, the cultivation of herbs for cookery had fallen into general disuse, except for the flavouring of stuffings and in those national sauces, like mint sauce and parsley sauce, which, with onion sauce, have been declared to be our only efforts in this direction. Most people were satisfied (and still are, I fear) with a packet or bottle of "mixed herbs"; and, provided they had a strong enough flavour to make themselves obvious, little attempt was made to differentiate between the various ingredients. It was unusual to find, in a kitchen garden, much more than a few clumps of parsley, mint and sage; and, as a well-known writer on food has complained, the parsley would have been better employed in the dish than garnishing it outside. The greater interest that has been taken in food and in cookery during the past few years, has brought about a change, and I believe that people are now more interested in herbs than ever before. Although this interest has arisen out of cooking, a great many people are still ignorant of the particular uses of the various herbs. I would like, therefore, to give some idea here, with a few recipes, of ways in which different herbs can be used in the kitchen; and, for a rough-and-ready method of assembling my notes, I will take the order in which these herbs are dealt with in the Bulletin. I ought, perhaps, to add that while Continental nations have always treated herbs with greater respect and discrimination than we have, sweet herbs were of course very largely, and often indiscriminately, used in our kitchens in past centuries. Whether this was because the popular palate was less refined than it is nowadays, or, as has often been suggested, in order to disguise the inferior quality of the meat or fish, I cannot say; but the fact remains that not only was the "bunch of sweet herbs" fairly omnipresent, but a great many herbs and seasonings were employed in cooking which would not be tolerated nowadays.

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1s., post free, 1s. 2d.

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Parsley. While seedsmen have concentrated their efforts on producing a beautiful curled plant for decoration, oddly enough the principal use to which this herb can be put demands the stalk rather than the leaf. I mean the *Bouquet garni*, so much and so admirably used in French cooking for flavouring stock and various sauces. This bouquet (the classic bunch of sweet herbs, perhaps) which Escoffier rather bluntly and far less picturesquely calls a "faggot," consists of two or three parsley stalks, a sprig of thyme, and a bayleaf tied together. (If any of the constituents are dried, then the bouquet is enclosed in a little piece of butter muslin, the aim in either instance being that it can be taken out of the stock, etc., when necessary.) The bouquet is invariably put into stock at the same time as the vegetables, and accounts for a good deal of the savouriness of French soups and sauces. It is a practice highly to be recommended, and an increasing number of English cooks make use of this delicious addition, the presence of which is really a hall-mark of good cooking. The other principal uses of parsley are for making parsley sauce, fried parsley and the usual veal forcemeat familiar to us all, also in maître d'hôtel butter, which consists of butter pounded up with very finely chopped parsley and a touch of lemon juice. This is used as a garnish for certain fried or grilled fish and with grilled meats.

Mint. Mint sauce has already been mentioned. English people are usually fond of vinegar, otherwise they would prefer mint jelly, which is really apple jelly flavoured with mint, mint leaves being infused in the apple juice before the sugar is added. In some French dishes, mint is included in the mixed herbs, but not in many. Its most famous use after mint sauce, is in the American Mint Julep, one of the recipes for which is as follows:

Add the leaves from a bunch of fresh mint to a cupful of lemon juice and half a cupful of water, and stir in a cupful and a half of castor sugar. Leave for half an hour. Put a large piece of ice in a jug or bowl and pour this infusion over it, adding three pints of ginger ale. A good drink for hot weather.

Sage. This very strong herb is, of course, best known in sage and onion stuffing, which it usually dominates to the exclusion of even the flavour of the meat it stuffs. I have found, however, that there is a faint affinity between dressed crab and sage, provided that the latter is used in infinitesimal quantities.

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Tarragon. Tarragon is one of the most delicate and delicious of all the herbs, and it is a pity that it is not better known; it is often difficult to obtain it fresh. Tarragon vinegar is fairly popular among those who exercise discrimination in salad dressing, and is quite easy to make at home. All that is necessary is to steep some fresh tarragon leaves in white wine vinegar (a teacupful to a quart of vinegar) in a closed jar for six weeks, and then to strain off and bottle the impregnated liquid. Tarragon has a perfect affinity with chicken, and to a lesser degree with rabbit, the addition of a few leaves to either, when boiled, making a great difference. When roasted, a chicken will be vastly improved in flavour if its own liver, chopped up with some tarragon leaves and then pounded with a good piece of butter, is placed inside the bird before it goes to the oven. The principal use of tarragon, however, is in the mixture that the French call *fines herbes*, which is used so extensively in their cooking and in dressing salads. This consists of the four herbs, tarragon, parsley, chives and chervil, in equal parts, very finely chopped and carefully mixed together. A salad of plain lettuce without this charming addition is like a salmon mayonnaise without the mayonnaise! The *fines herbes* should be sprinkled lightly over the salad before it is dressed, but they should not be mixed with the dressing, as their principal charm lies in their freshness, which would be lost if they were soaked in the vinegar. *Fines herbes* are excellent when mixed with mashed potato.

Horseradish. This is seldom used in this country save scraped or in a sauce, with beef. In Sweden a purée of apples cooked with a little white wine, into which is stirred some grated horseradish, is popular with certain meat dishes, and a mayonnaise is flavoured in the same way.

Thyme. This has already been mentioned in the parsley paragraph as being one of the components of the *bouquet garni*. Apart from its further use for stuffings, there are possibilities in the use of the specially-flavoured thymes, such as Lemon Thyme, in custards and creams, the leaves being infused in the milk before the custard is made.

Fennel. This herb was at one time used in England for a fish sauce as commonly as parsley is now, chopped blanched fennel leaves being added to a white sauce in the same way

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as parsley, with which it was sometimes combined. A simpler fennel sauce needs merely the addition of the chopped blanched leaves to melted butter, and this will be found to be excellent with mackerel and, according to many, also with salmon. The fennel that many of us have eaten on the Continent is Florence Fennel, which is earthed up like celery. The heads are left to soak, after they have been trimmed, in salt water for half an hour and can then be boiled or braised in the same way as celery. When cooked they may also be dressed with cheese and served *au gratin*.

Sorrel. The principal uses of sorrel are as a vegetable rather than a herb, although its astringent leaves give a pleasant taste to a salad. With certain dishes of white meat, or those with which spinach goes particularly well, sorrel can be used as a purée, being cooked in the same way as spinach.

Pick as young as possible, and, if necessary, strip off the stalks. Wash them in several waters, and drain well, then boil them gently in water for five minutes. A scant half-pint of water would be enough for a pound of the leaves (which will be enough for two people), and it is wiser to stir the leaves with a wooden spoon as they boil, for they easily stick to the sides of the pan. After five minutes' boiling, turn the leaves into a colander, and let them drain well again. Now chop them finely on a board, and put them back into the pan in which you have mixed a spoonful of flour with the same quantity of melted butter. Then pour in about a coffee-cupful of white stock, and simmer for about an hour with the lid on the pan, stirring occasionally. If desired, one can bind this purée with a yolk of egg beaten up in a little cream. Sorrell Soup is particularly good, too, and the well-known Potage Santé is really only leek and potato soup garnished with thin strips of sorrel.

Borage. This is a pretty enough herb, but I doubt if it has any serious kitchen use. Its leaves and flowers look very handsome in a white wine cup, but nowadays the stronger flavour of cucumber peel itself is preferred.

Chervil. This delicate little plant is, as already indicated, one of the ingredients of *fines herbes*. It goes well with chicken and with eggs, and the fine little leaves are greatly used in garnishing cold jellied dishes, meat, fish and eggs, to which they also impart its charming but fugitive flavour. The smallest pieces of the leaves, known as *pluches* in culinary language, are used for garnishing soups.

Marjoram. This herb has a flavour which many prefer to thyme, and is therefore often used to supplant the latter in stuffings or in the *bouquet garni*. A sprinkling over a joint

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of roast pork is vastly preferable to sage, which is sometimes recommended for use in this way.

Savory. This attractive-looking and pleasantly smelling herb, reminiscent a little of sage without its coarseness of flavour, is used in France to cook with broad beans and also with peas. We Britons are too wedded to our love of plainly-cooked green peas to like this fashion; but those who like peas cooked *à la française* should try it. With broad beans, it is wholly to be commended, but it must be remembered that the beans should be cooked without their skins:

Shell the beans and put them into boiling water and let them boil for a few minutes. Take them out and they will easily slip out of the skins. Now put them into a saucepan containing just enough water to cover them, add a few sprigs of savory, salt, of course, and cook them gently until they are tender. Drain the water off, dry the beans quickly over the fire, add a piece of butter, roll the beans in it carefully so as not to break them, and serve them. One may add a very little finely-chopped savory leaves afterwards, if the flavour is much liked, but these would have to be blanched first or they would be too strong.

Basil. This is a herb that is sadly neglected. It is used principally in the making of turtle soup, also mock turtle soup, when its flavour is easily recognized. Its principal virtue, however, lies in its marvellous affinity for tomatoes, and I would go so far as to say that no tomato soup or sauce should be made without at any rate a touch of basil in it. It should certainly be tried in forcemeats.

Rosemary. I have taken this out of another section of the Bulletin because there is a dish in which it is used that is so good that it ought to be better known. The strong leaves of this plant are used in Italy for flavouring a ragout of veal, but in Germany they are used mainly in the following dish of hare, or, better still, leveret:

For it, you want the whole of the back of the leveret, which the French call the *rible* and is really the whole of the back from the neck to the hind legs. Skin it down to the flesh and put some pieces of fat bacon over the top. Now roast this on a bed of chopped onions and carrots with a *bouquet garni* of thyme, parsley, bayleaf and a sprig of rosemary in the middle. When it is nearly done, take off the bacon to let the back brown, and when it is done, take out the vegetables and the bouquet and pour into the pan a cupful of cream. Stir this well with the juices left in the pan, and let it boil up; add a touch of lemon juice and pour it over the leveret.

Coriander. This and Dill I have taken from another section of the Bulletin, as, in some parts of Europe, they are

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used in the kitchen. Coriander, which has an orangey flavour, is used in cakes and biscuits as well as to flavour custards.

Dill. The seeds of this herb are sometimes used for flavouring vinegar, in which it is steeped for a few days before the vinegar is wanted. It has, however, lost the popularity it enjoyed two hundred or so years ago. Its leaves are used in Scandinavia in flavouring sauces for meat. It is also used largely in Germany in the pickling of cucumbers, as it was at one time in this country.

Caraway. I should have added Caraway, as the seeds of this herb are used in Hungary in the well-known *Goulash*, a stew of meat, onions, potatoes and paprika pepper. As this is a dish worth trying, I give it here:

Cut three medium-sized onions in thin slices, and brown them in a pan in a little lard with about 1½ lb. of beef cut in two-inch squares. Add a little salt, a teaspoonful of caraway seeds in a muslin bag, one or two teaspoonfuls of paprika pepper, three or four peeled and chopped tomatoes and half a cupful of water. Cover and cook for an hour and a half to two hours, then add a cupful of water and seven or eight smallish peeled potatoes. Cover again and cook for another hour, when the potatoes should be done but still whole. Then serve very hot.

Chives.* Though chives are not mentioned in the *Herbs Bulletin*, they have been referred to as one of the *finest herbes*. They are really a very small onion, quite easy to grow and best propagated, I have found, by division. The tiny bulbs are used by some for pickling, but the real value of the plant lies in the grassy leaves which it throws up in great profusion. As it possesses a pretty mauve flower, rather like thrift, it makes a useful border plant for the kitchen or herb garden. As I have said, the leaves are one of the ingredients of *finest herbes*, but they are very good if used by themselves, finely chopped, especially with mashed potatoes, with potato salad (instead of onion), and in omelettes. Those who like a flavoured cream cheese can make an excellent one by beating up some of the chopped leaves with one, or some chopped *finest herbes*, if chives alone have too oniony a flavour.

Bay. This, of course, is not a herb, but it has been mentioned in the *bouquet garni*. The only comment I wish to make here is that, in a great many carelessly translated cookery

* Chives are dealt with in the Ministry's Bulletin No. 69, *Onions and Related Crops*. Obtainable from H.M. Stationery Office. Price 1s., post free, 1s. 2d.

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books, the French for Bay (*laurier*) has been given as Laurel. It would hardly be pleasant to include a laurel leaf in your *bouquet garni*, so if any of my readers commit this far too common mistake they will be on their guard. Bayleaves, by the way, have an affinity in flavour with cauliflower, as will be discovered if, when next a cauliflower soup is made, a bayleaf is added or infused in the milk.

Conclusion. I have touched here on a number of uses for various herbs in the kitchen, and, on looking through what I have written, I can see how slight my knowledge is. In most European countries, there are recipes depending almost entirely on certain herbs for their flavour, but it would take a lifetime to make an exhaustive study of them. In Switzerland, for instance, thyme is used for flavouring a certain cheese; in the south of France, fennel is more widely employed than elsewhere; in Brittany, mint is added to the *bouquet garni* in a certain fish soup; while, in America, sage, I believe, is put to more uses than could be thought possible. Perhaps after a few more years' experience in the art and practice of cooking, I may be able to return to this entrancing subject. Meanwhile, like Candide, I must "*cultiver mon jardin.*"

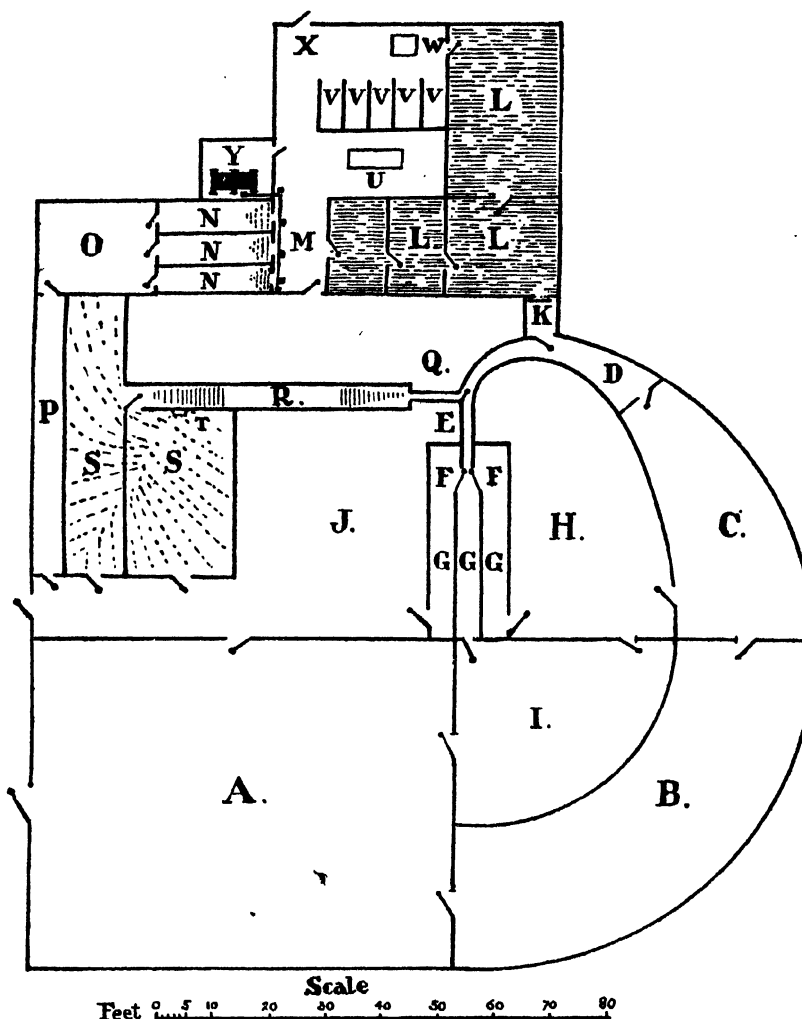
AUSTRALIAN SHEEPYARDS AND SHEARING SHEDS

GEORGE BERRIE

AUSTRALIA depastures over one hundred million merino sheep, pre-eminent in the world's production of fine wool. There are stations where upwards of a hundred thousand head are managed as one flock, but run in separate sections according to age and sex. Stud rams have been sold in Sydney for as high a figure as five thousand guineas. It follows that during many years of scientific flock-building the problems of efficient handling have not been neglected, and the object of this article is to illustrate the Australian system of drafting yards, shearing sheds and dipping baths, in the hope that they may prove of practical interest to the British sheepbreeder, either large or small. The diagram accompanying shows a combination of all three, which makes for economy in construction, and labour saving in actual use. The plans of both yards and bath are now generally accepted as a standard in Australia. Shearing-shed designs vary considerably according to numbers, but, for small flock-owners, the one here illustrated will be found satisfactory. The writer has actually built the complete outfit as shown, managed sheep stations both large and small, and had years of experience in charge of machine-shearing operations on a large scale; he knows the advantage of a carefully planned outfit to the sheep and to the men who handle them. He does not wish this article, however, to be regarded as an attempt to teach the British sheep-farmer his job.

Some very pleasant weeks spent, this summer, in one of the leading sheep counties in Britain failed to reveal anything effective in the way of either yards, shed or dip. Yet in every other respect, in the housing and feeding of pigs, cattle and sheep, in manuring, crop rotation and scientific cultivation, the methods were well thought out, buildings carefully planned, and the work thoroughly effective. The care taken of the sheep by their shepherds was almost minute. The writer has never seen more conscientious or intelligent stock-hands than those shepherds, and they certainly deserve better facilities.

On all well-managed Australian sheep stations the wool clip is prepared for auction in the shearing shed. It is not



PLAN OF AN AUSTRALIAN SHEEPYARD AND SHEARING SHED.

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|---|---|
| A. Main Receiving Yard. | O. Exit yard for sheared sheep. |
| B., C., D. Driving yards. | P. Branding race. |
| E. Drafting race. | Q. Gate; shutting off dipping channel |
| F. Drafting gates. | R. Dipping bath. |
| G. Check or observation pens. | S. Draining pens, with floors sloping to T. |
| H., I., J. Yards for sheep awaiting shearing. | T. Pipe carrying drainings back to bath |
| K. Ramp up to shearing shed. | U. Table for fleeces. |
| L. Pens for sheep awaiting shearing. | V. Wool bins. |
| M. Shearing floor. | W. Woolpress. |
| N. Sloping pens for exit of sheared sheep. | X. Bag or bale space. |
| | Y. Engine shed. |

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suggested that anything so elaborate as the Australian system is either necessary or desirable here. On one farm which the writer visited, the wool from Oxford and Suffolk crosses was kept separate, and dags and stained wool were removed from the fleeces. Had patches of heavy, sandy wool been ripped out and some badly matted fleeces kept apart, it is certain that the sale of that clip would have been improved. The shepherd who was shearing could easily have done all that was necessary, especially if he had been given a table to work on instead of the floor.

In the appended plan, the scale of the yards is designed for working a thousand sheep and the shed to accommodate three shearers. Either can be reduced or increased in capacity. The dipping bath is a standard which it is not advisable to vary, the length of the swim being calculated to give sufficient time for immersion. A co-operative bath erected in a central position might be a practical proposition in some localities. The flocks of half-a-dozen average-size farms could be dipped comfortably in a forenoon.

In order to explain the working of the plan, we may begin by bringing in a flock for shearing into the main receiving yard (A), which will hold a thousand sheep comfortably. Thence they are driven round the semi-circle through yards B, C and D to the drafting race at E. For merinos, the race is usually fourteen inches in width and twelve feet in length, for British breeds it would probably need to be both wider and longer. Opposite the end of the race there are three long check, or observation pens about five feet in width (G), and the two drafting gates (F) hang on the end posts of the centre pen. When drafted into these pens, the sheep can be easily examined for mistakes made by the drafter. If no examination is necessary, the gates can be left open, and the sheep pass into yards H, I and J; H being used for the portion of the flock to be shorn first. It is then taken through yards C and D, to where a ramp at K leads up into the shearing shed, usually built from two to three feet from the ground. At the entrance to K, a gate in the fence allows access from yard D by swinging across to the opposite fence and shutting off the approach to the race (E).

The shaded portions of the building (marked L) accommodate woolly sheep, and the floor space is of grating. Hardwood battens are used, an inch and a half in width, and an inch in depth, and they are placed three-quarters of an inch

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apart, allowing excreta to fall or to be trampled through. The shearing floor is at M, and each of the three shearers works opposite one of the long pens (N), which are outside the building. There is an opening into each pen through the wall, and a chute from the floor to the ground to allow the sheep an easy passage outwards. The number of sheep shorn by each man can be checked and faulty work noticed, a very necessary provision in Australia where all shearing is piece-work. Yard O holds the sheep when let out of the counting-out pens (N). Thence they pass through the branding race (P), and finally back to their fields.

In the shearing shed, if machines are used and they are of the belt-driven variety, they are erected on the wall above the chutes leading to the counting-out pens (N), and the shearers catch their sheep from the pen opposite them across the shearing floor (M). Y is a small room outside the main building and accommodates the engine, grinder and a working bench. If a portable shearing plant is used, it is placed in the most convenient position on the floor (M), but in point of efficiency it does not compare with a belt-driven overhead outfit. As the fleeces are shorn they are thrown on to the wool-table (U), skirted, rolled, and placed in the woolbins (V), according to classification. Opposite these bins, a woolpress stands at W, and the bales or bags are stacked in the remaining space marked X. The divisions inside the building are usually merely made sheep-proof, and the bins hold the equivalent of a bale of wool when unpressed. Skylights and windows are built in as required for light and ventilation. The space under the shed, as well as in it, is found very useful in case of a risky weather change during shearing.

In the working of the dipping bath, the sheep are brought round to the small forcing yard (D) as if for drafting, but at the race marked Q there is a narrow gate let into the fence which shuts the entrance into this race when drafting. This gate, on being opened, swings inwards across the entrance to drafting race (E), closing it and leaving race Q open. The sheep are forced along this race to the dipping bath (R), which is fifty feet in length over all, five feet in depth, two feet in width at the top and one at the bottom. At the entrance end there is a steep slide into the water, at the other, an easy gradient where the sheep walk out into the draining pens (S). The floors of these pens are given a gradual slope to point T where an underground delivery pipe

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capped by a strainer carries the drained liquid back into the bath. The sheep are ducked twice while swimming.

As illustrating the labour-saving efficiency of the sheep-yards, the writer once saw sixteen thousand sheep drafted in one working day by five men: the yards, of course, were on a much larger scale than in the plan accompanying this article. To put seven hundred sheep through this walk-in, walk-out dipping bath is a comfortable hour's work. For dagging, drenching, footrotting or *any* sheep work, the shearing shed is just as useful as it is for shearing. It is certain that no up-to-date British sheep-farmer would be without yards, shed, or dip of this plan, once he knew the comfort of working in them. To anyone interested, the writer will be only too glad to supply any further details required.

HEREFORDSHIRE ORCHARDS: "A PATTERN FOR ALL ENGLAND" IN 1657

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MODESTY as a virtue must be a modern idea. The more early books on branches of farming I read, the more I become convinced that these writers did not believe in it, and I can find little evidence that others of their contemporaries believed in it either. John Beale, who wrote a book about "Herefordshire Orchards" in 1657, is no exception. The book was addressed to Samuel Hartlib, who was at about that date responsible for issuing a good many books on farming: and Beale had the greatest admiration for Hartlib as well as for himself and for Herefordshire. He calls Hartlib "The zealous Sollicitor of Christian peace Amongst all Nations; the constant Friend of distressed Strangers; the true hearted lover of our Native Countrey; the sedulous advancer of Ingenious Arts and Profitable Sciences, and the Principall Contriver of Generall Accommodations." It is rather a pity there was no more space on the page of the "address"! Hartlib, however, heartily returned Beale's admiration, not without just cause, "as a man to do good," because Beale praises his publications, saying, "in my rural retirement I have received some profit and very much innocent and refreshing delights in the perusall of those treatises, which are by your diligent hand communicated to the public."

Of himself, Beale reports in his book: "My education was amongst Schollars in Academyes, where I spent many years in conversing with vanity of books only. A little before our wars began, I spent two summers in travelling towards the South, with purpose to learn to know men and foreign manners. Since my return I have constantly been employed in a weighty office . . ." He carried out a request of Hartlib, and in his book "gives some plain and unpolished account of our *Agriculture in Herefordshire*."

In fact Beale was descended from a good family of Herefordshire. He was born in 1603, educated at Worcester and Eton, went to King's College, Cambridge, in 1629, graduated B.A. in 1632, M.A. in 1636, and was made a D.D.

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His modesty is again evident in the emphasis he lays upon his industry while engaged upon his studies. He did his utmost to cultivate a retentive memory, learning large parts of books by heart, so much so that according to his own account he became something of a prodigy and was able to read books on booksellers' stalls and remember their contents.

Besides his correspondence with Hartlib, he was often in communication with the Hon. Robert Boyle, and other distinguished people. In 1660 he became Rector of Yeovil, where he spent the rest of his life. He was also rector of Sock Dennis and was an early member of the Royal Society. In 1665 he became Chaplain to Charles II. His achievements do something to justify his good opinion of himself.

Naturally such a man was a local patriot, and he cannot find anything too good to say about the farming of his native county. Here again he had a large measure of justice, because Hereford and Worcester were early recognized as examples of the advanced farming of the day.

The gentry of Hereford were, Beale tells us, "very careful in setting forward such kind of husbandry as best agrees with the nature of the soil where he inhabiteth. From the greatest person to the poorest cottager, all habitations are encompassed with Orchards and Gardens, and in most places our hedges are enriched with rows of fruit trees, pears or apples, Gennet-moyles or crab-trees."

The pears were used for making a "weak drink for our hindes." It was refused by the gentry "as breeding wind in the stomach" but "is most pleasing to the female palat, having a relish of weak wine mixed with sugar." One of the pears was the White Horse pear, and Bosbury was famous for a peculiar perry. The Barcland pear made good perry, but was too hard and coarse to bite.

A rough distribution of the types is given. Gennet-moyles and hedge-pears grew in the worst soils, near Irchinfield or towards Wales. They were nice fruit but on such soils the crop might be expected to fail every other year. The Gennet-moyle was the best cider fruit. Indeed Beale preferred it to the famous Red-streak. It also was good for "pyes and tarts." The crab apple was commonly ground for verjuice, but the Bromsbury-crab, "a fresh wonder, lately found out," makes one of the best ciders. Pippins were also used for cider. In spring, of course, the multitude of fruit trees

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"much ornamented the countryside," as they still do to-day. Moreover, in Beale's opinion the orchards "purifie the ambient air."

Cider was the universal drink. "Few cottages," says Beale, "yea, very few of our wealthiest yeomen, do taste any other drink in the family, except at some speciall festivalls, twice or thrice in the year; and that for vanity, rather than choice." The same blessings were enjoyed "in our borderers of Shropshire, Worcestershire and Gloucestershire." Cider was, of course, also made in Somerset, and much more, so Beale says, in Kent and Essex.

He makes some attempt to classify the districts by soils. Bromyard had a cold air and a shallow, barren soil. "About *Ross* and *Webley*, and towards the *Hay*, a shallow, hot, sandy or stony rye land and expos'd to a changeable air from the disgusts of the black mountain; yet here and all over *Irchinfield*, and also about *Lemster* both towards *Keinton* and towards *Fayremile* in all these barren provinces," there were as good orchards as in "the Richest Vale . . . even by *Frome* banks." Beale considered that Worcester was more suitable for pears and cherries, while Hereford excelled in apples.

The root of the pear tree is more piercing and clays suit it: the best cider and eating apples grow in shallower soils, less commended for other uses, and preferably on high ground or highland. "What *Columella* says of Vines," he add, "I may as truly say of Fruit trees." In addition to *Columella*, Beale had also studied a book, almost contemporary, on orchards written by William Lawson in 1638. Lawson was a North country man, and there was much in the book so strange to Beale that he laughed at it, as did many of his friends. After trying out Lawson's directions in practical experiments, however, he found the system a good one, even though he did not find it practised locally; and he adds a warning to all experimenters which is just as valid to-day: "Trust not one yeares triall."

"One reason," he adds, "why fruit do so abound in this County, is, for that no man hath of late years built him a house, but with speciall regard for the proximity of some ground fit for an Orchard." Even the servants built their cottages on suitable land. The choice of a site was with a slope towards the south, on a soil of some depth, but not too friable.

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Beale envisaged the day when Hereford should become a great market-garden county, but he mournfully says, "For Gardens we have little encouragement to designe more than is for the necessary use of our own families, except our River Wye be made navigable for transportation." Road transport was of course so slow because of the heavy waggons used, and so difficult because many of the so-called roads, mere dirt tracks, were impassable or almost so. These difficulties no longer exist, of course, and his prophecy has come true.

The humble conclusion is that "We are generally noted to excel in all kinds of husbandry: our ploughs are light, but we listen after further directions which come to us through your hands. The rye of *Clehanger* and some parts of *Irchinfield* is as good as the Muncorne or Miscellane of many other Countreys; and our wheat is upon the ground farre richer than I saw any in the fair vale of *Esome* in *Worcestershire* and *Warwickshire*.

"For pastures we add improvements daily and as a stranger passeth by our habitations, by our fences, orchards, pastures, arable, he may distinguish a well-ordered house-keeper and a freeholder, from an over-wracked Tenant and an unthrift."

THE INTERPLANTING OF OBERSCHLESIEIN AND TARDIVE DE LEOPOLD STRAWBERRIES WITH POLLINATOR VARIETIES

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THE period following the Great War is notable in the annals of strawberry growing in Great Britain for the widespread and serious decline that overtook all the then recognized commercial varieties, also for the introduction into this country of numerous varieties from the Continent. Of the latter, two varieties quickly established themselves in commercial cultivation—Oberschlesien and Tardive de Leopold. It is freely admitted that when first introduced, and for some time afterwards, these two sorts contained a greater or less admixture of rogues, but, notwithstanding this variety mixture, cropping and growth were both satisfactory. Through the introduction of the Ministry's certification scheme for strawberries, these two varieties were established true to name and free from rogues. Subsequently, large-scale plantings of pure stocks were made for runner production and fruiting, particularly in the Vale of Evesham.

The variety Tardive de Leopold was recognized as self-sterile almost from its introduction, and, since it does not produce any pollen, the necessity for interplanting it with a pollinator variety was evident. Previous to the establishment of pure stocks of both Tardive de Leopold and Oberschlesien, the rogue plants provided the necessary cross-pollination, but subsequently a definite interplanting system became necessary. Since the variety Oberschlesien was in favour and was possessed by the grower, it was not surprising that it was used on a large scale as the interplant for Tardive de Leopold. In fact, from 1928 to 1930 or 1931, large plantings of these two varieties were made in the Bristol Province.

By 1930, it was found that this planting scheme was not satisfactory, because the cropping of both varieties had fallen to a very low ebb, in spite of vigorous growth and copious blossoming. Further, both varieties were producing a large proportion of malformed or "hard-ended" berries. Indeed, this latter condition became so common that it was



Photos : Dr. Swarbrick.

1. Tardive de Leopold pollinated with Royal Sovereign ; and 2. Tardive de Leopold pollinated with Huxley—note in each, complete set of well-shaped fruits. 3. Tardive de Leopold pollinated with Oberschlesien : note partial set and the malformed fruits.



Photos : Dr. Swarbrick.

4. Oberschlesien self-pollinated : note the malformed fruits. 5. Oberschlesien pollinated with Royal Sovereign. 6. Oberschlesien pollinated with Huxley. Note in 5 and 6 complete set of well-shaped fruits.

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regarded as a characteristic of Oberschlesien, and was a serious defect, particularly from the canner's point of view.

The matter was brought to a head in the same year by the writer being called upon to investigate two cases of the non-cropping of Tardive de Leopold on large-scale holdings. In both instances, it was established beyond any doubt that the plants were healthy and had blossomed freely: disease was obviously not the main cause of the falling away of the crop. In both cases, Oberschlesien had been used as the interplant, and the lack of necessary cross-pollination was suspected as the main cause of the crop failure. Experiments to determine this point were initiated at Long Ashton and the present report sets out the application of the results of this work to the problems of commercial production.

The primary object of the experiments carried out at Long Ashton from 1930 to 1935 was to determine, within the limits of commercial possibility, the best pollinator varieties for Tardive de Leopold. The three sorts, Royal Sovereign, Oberschlesien and Huxley were used as a source of pollen for the flowers of Tardive de Leopold, and repeated experiments showed that, while both Royal Sovereign and Huxley invariably gave a good "set" of fruits the pollen from Oberschlesien gave rise to an indifferent crop of partially malformed and "hard-ended" fruits. The difference was most noticeable, and is illustrated in Figs. 1, 2 and 3, which show plants of Tardive de Leopold pollinated respectively with Royal Sovereign, Huxley and Oberschlesien. The crop failure of Tardive when interplanted with Oberschlesien was clearly due to the inability of the Oberschlesien to provide adequate cross-pollination.

The work was then expanded to discover, if possible, the reason for the failure of Oberschlesien to provide adequate cross-pollination of the Tardive flowers. It was found that Oberschlesien was itself partially self-sterile, and that even when it was pollinated daily with its own pollen it produced an indifferent crop of fruit, many of which were slightly malformed. This condition is illustrated in Fig. 4. Pollen germination tests showed that although Oberschlesien produces plenty of pollen, much of it fails to germinate even under ideal conditions, and that in any event germination is slow and the resulting germ-tubes are short. The difference between Oberschlesien and Royal Sovereign is shown by the fact that whereas, under similar conditions, 90 per cent. of

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the Royal Sovereign pollen germinated in 7-10 hours, only 30 per cent. of the Oberschlesien pollen germinated in 24-36 hours.

Since Oberschlesien proved to be partially self-sterile, the work was still further expanded in order to determine satisfactory pollinators for this variety. Royal Sovereign and Huxley have both proved suitable. Photographs of typical plants of Oberschlesien pollinated respectively with Royal Sovereign and Huxley are shown in Figs. 5 and 6.

General Recommendations. Experience throughout the strawberry-growing areas of the country shows that both Oberschlesien and Tardive de Leopold do not now yield the heavy crops that were obtained during the years immediately following their introduction, and are, in fact, falling in popularity. In many cases vigour and blossoming are still satisfactory. Sufficient attention, however, is not given to their needs in the matter of cross-pollination. Experiments have shown that Oberschlesien is not a satisfactory interplant for Tardive de Leopold. Further, Oberschlesien, being itself partially self-sterile, should not be planted as a single variety, but provision should be made for its cross-pollination. Royal Sovereign and Huxley have each proved satisfactory as interplants for both Tardive de Leopold and Oberschlesien. While controlled experiments have not been carried out at Long Ashton, it has been reported to the writer that Madame Lefevre is also satisfactory as a pollinator for Tardive de Leopold.

It is essential that only good stocks of plants be used, otherwise the interplant may die out, thus leaving the main variety still unpollinated. Experiments in the field suggest that a better result is obtained by having four or five rows of pollinator and pollinated varieties. The variety to be pollinated should be flanked on both sides by a pollinator.

A PHYSICAL TEST FOR LING HONEY

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THE judging of honey at shows is an art that requires considerable experience and is always open to a certain amount of criticism. No two judges are certain to give the same awards. The same judge may make different decisions on different occasions. Even when using the score card system, it cannot be said that the merits of different honeys can be numerically expressed. In other words, so-called "organoleptic tests" are uncertain, and it is impossible to convey with any accuracy the grounds on which honeys of a series under consideration are placed in a given order.

Tea and wine tasters are, no doubt, of great assistance to the firms that employ their services, but the excise department and the analyst require specific gravity tests and chemical reactions that do not depend on a man's opinion. Definite data are being obtained, on which such commodities as malting barley and flour, can be evaluated on grounds more convincing and reliable than the pronouncements of an expert, however long his experience may have been.

It seems desirable that attempts should be made to express the quality of honey similarly in terms of analysis or physical properties that may be determined precisely, by means of tests that are capable of repetition, and as far as possible to exclude the personal factor of judgment, however skilled. The inclusion of honey in the National Mark scheme meant that honey so packed had to conform to certain standards of clarity, colour, water content (conversely, total solids) and sucrose (cane sugar) content. A limit was placed on the percentage of water allowed, on the grounds that fermentation is apt to occur if it exceeds a certain amount. This was fixed on the safe side, as sales of honey are much injured if honey that is fermented or otherwise below standard is offered for sale.

The amount of water present may be determined from the density of the honey. There has been much confusion among beekeepers in the past over the term density: it has often been treated as synonymous with viscosity.

Density or specific gravity can be measured by weighing

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a sample of known volume, or by the use of a hydrometer which floats high or low according to the density of the honey or other liquid. The hydrometer is a familiar method of testing the acid in an accumulator. The specific gravity bead, which is recommended for the use of honey packers, works on this principle. This is the commonest way of arriving at the water content of honey. Density varies slightly with temperature but allowance can be made for this.

The *viscosity* of a liquid, on the other hand, is a measure of its flow properties, and is not necessarily connected with its density. Heavy oils, for example, flow slowly and are of high viscosity, but of lower specific gravity than water, on which they would float. The viscosity of honey, though a distinct property, is related to the specific gravity because honey is not a simple liquid like an oil, but a solution of sugars in water. The viscosity of honey varies considerably with the temperature.

When the test of density was applied to heather honeys, many samples were found to have too high a water content to be included within the limits of the National Mark scheme. As it seemed that this excess of moisture did not in all cases allow the honey to ferment, these honeys were examined to see if they possessed any special property that might reasonably excuse departure from this standard. The jelly-like nature of ling honey has long been known in connexion with the production of bottled heather honey. Because of this property it is not possible to use the centrifugal extractor in the ordinary way. The usual method is to press the combs and so destroy them. In recent years the Dutch have to some extent used a machine that, by dropping loose steel rods into the cells, breaks up the jelly structure and allows some air to enter. If combs are put into the ordinary extractor within twenty minutes or so of being so treated, it is then possible to remove the honey by centrifugal force in the usual way.

The Flow Properties of Heather Honey. It has been shown¹ that honeys from a great variety of sources, not including heather, behave almost as "true fluids." This means that if, for example, such honeys are forced through narrow tubes under pressure, they flow at a rate proportional to the pressure applied, and also that no amount of stirring,

¹ Paine, Gertler and Lothrop: Colloid Constituents of Honey, *Ind. & Eng. Chem.*, 26, 1934, 73-81.

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either caused by the flowing process itself or by deliberate mixing, will affect the ease of flow.

Now ling (*Calluna*) honey is quite unlike a "true fluid."¹ If it is forced through a tube, or if a small ball is allowed to fall through it, the rate of flow is not proportional to the pressure applied. For example, when the pressure is doubled it will yield at a rate which is far more than doubled. Moreover, newly-stirred honey, whether the stirring is deliberate or produced by flowing in some kind of test, flows much more readily than honey that has been left to stand for some time. Both these properties are well-known with other materials. The former has been called "structural viscosity" and the latter "thixotropy." With ling honey, the two are clearly connected. There is good reason to suppose that in the honey, the sugar molecules tend to arrange themselves into a sort of structure rather like scaffolding around a building. When the honey is stirred, or caused to flow, this structure is temporarily destroyed, and only re-establishes itself gradually, and it is natural that the bigger the pressure used, the more complete is the temporary destruction of the structure.

A convenient method of observing how far any particular honey shows such a capacity to form a structure has been described by Scott-Blair.² A $\frac{1}{4}$ -in. steel ball-bearing is dropped through a sample that has been allowed to stand for some time, then the sample is stirred thoroughly, and another ball is dropped. With ordinary honey the two balls will fall at the same rate, but with heather honey, the ball in the unstirred honey will fall many times more slowly than that in the stirred. If, for example, in a given sample the ball falls ten times as slowly, this honey is said to have a "thixotropy ratio" of ten. Thixotropy ratios depend on such things as temperature, size of ball used in test, etc., but under fairly standard conditions, they give a good indication of how much "structure" a honey is capable of building up. Some of the water in the honey is needed for this purpose, and it is known that water so utilized has properties different from those of ordinary water. Since honeys that show marked structure can presumably hold more water without fermenting than can structureless honeys, it is reasonable to suppose

¹ De Boer and Kniphorst: Thixotropie van Heidenhonig, *Chem. Weekblad*, 29, 1932, 526-534.

² Scott Blair: The Thixotropy of Heather Honey, *Jour. Phys. Chem.*, 39, 1935, 213-219.

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that water which is bound into the structure is not available for the use of ferments. Some ling honeys produce such a rigid structure that after some hours standing they set into solid jellies. Such honeys often give thixotropy ratios of as much as several thousand, i.e., a steel ball falls through them some thousands of times faster after vigorous stirring, than it did before.

It is important to inquire what plants give thixotropic honey, and whether the conditions of growth of the plant (soil, climate, etc.) affect the extent of the thixotropy or structural viscosity. For this purpose, samples of honey are required from sources that the beekeeper can guarantee.

There has been designed a test that necessitates only a few drops of honey, an obvious advantage, since a beekeeper could be sure of the source of a small corner of a comb, when he could not guarantee that the whole comb had been laid down from the same plant.

Although very small ball bearings are obtainable, there are serious technical difficulties in using the falling ball methods for such minute samples, and a flow method has been devised, this, however, involving the use of somewhat complex apparatus, so that it is intended for the research laboratory. In the meantime the authors would be grateful for samples of heather (ling) honey from any beekeepers who can guarantee a pure ling source, and supply some information as to the soil and climatic conditions where the plant grew. About a thimblefull of honey is ample.

The above methods are not the only possible ways of studying these phenomena. A great many methods are possible, but these have been chosen as the most suitable for this particular problem.

The Specific Nature of the Plant. It is a very curious fact that whereas most honeys derived from ling (*Calluna vulgaris*) are highly thixotropic, those derived from heathers such as *Erica cinerea* and *Erica tetralix* are not. Although Paine, Gertler and Lothrop (*loc. cit.*) were not looking for thixotropy among the honeys from so many sources which they examined, they could not have failed to note and comment on such a phenomenon had it occurred to any marked degree. With the possible exception of buckwheat, no plants that have been examined, give thixotropic honeys except ling (*Calluna vulgaris*), and the New Zealand plant manuka (*Leptospermum*

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scoparium). There may, of course, be others, but even so the phenomenon is exceedingly rare. Thixotropy must be due to the presence of some chemical substance that reaches the honey through the plant. Its presence clearly depends on the nature of the plant, and possibly, also on the chemical composition of the soil in which the plant grows. This matter is being further investigated at Rothamsted.

Details of the Thixotropy Test. Since the thixotropy ratio obtained for a honey depends to some extent on the exact way in which the test is done, it is as well that the following method should be followed as closely as possible.

The honey is poured into a tube known as a "100-cc. Nessler tube" so as to fill the tube right to the top, and left to stand overnight. (The tubes may be obtained from manufacturers of chemical apparatus at a cost of about 2s.) Granulated honey must not be used for the test. The tubes are marked with two lines about $2\frac{1}{4}$ in. apart. For the first test the $\frac{1}{4}$ -in. ball bearing is laid on the surface of the honey in the middle of the tube* and the times at which the centre of the ball passes the two lines are recorded. The second hand of an ordinary watch is adequate for this purpose, though if a stop watch is available, it is somewhat more convenient.

For the second test a metal disk perforated with holes is mounted on a metal rod so that it just slides freely in the glass cylinder.†

The honey is stirred by pushing this stirrer to the bottom of the cylinder and withdrawing it; this is done twice. *Immediately* after this, the ball-bearing is dropped and the time taken in passing the two lines is recorded as before.

The "thixotropy ratio" is simply obtained by dividing the time taken for the ball to fall between the marks in the first test by that taken in the second test. In order to see the ball in honeys that are opaque owing to air bubbles, it is best to stand the tube on a window-sill with the daylight for background, and to stand back slightly from the tube when making the observations. A good light is essential.

Since writing this article, the authors have read with great interest a paper by Mr. J. Pryce Jones (*Bee World*, August 1936), in which the thixotropy of honey is discussed.

* If the honey is opaque with air bubbles, the ball, to be visible, may have to be placed slightly to one side, but it should never be allowed to fall near the wall of the tube.

† Arrangements are being made to have these placed on sale.

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Milk Marketing Scheme: Milk Contract Prices, 1936-37.

The price and other terms of the wholesale milk contract to operate for the period October 1, 1936, to September 30, 1937, have been agreed between the Milk Marketing Board and the Central Milk Distributive Committee, representing purchasers of milk by wholesale, and the contract has been prescribed by the Board. The new contract is similar to the previous contract as amended by the Minister and embodies the adjustments regarding which assurances were given to the Minister by the Board.*

The monthly wholesale prices of milk for liquid consumption will be the same as in 1935-36, viz; 1s. 5d. per gal. from October to March, 1s. 4d. in April, 1s. in May and July, 1s. 1d. in July and August, and 1s. 3d. in September, giving an average price of 15s. 3d. per 12 gal. over the year. An additional $\frac{1}{4}$ d. per gal. is to be paid on purchases during May, 1937, being the distributors' share of a joint contribution of $\frac{1}{4}$ d. per gal. for milk publicity. The corresponding yearly prices in each year since the commencement of the Scheme have been as follows:—

1933-34	.. ..	14s. 4d.	per 12 gallons in the S.E. region.
		13s. 9d.	.. .. other regions.
1934-35	.. ..	15s. 1d.	.. .. all regions.
1935-36	.. ..	15s. 3d. " "

The prices of milk used for manufacture are contained in a separate schedule of rebate conditions. The formulæ for ascertaining the prices to be paid monthly for milk manufactured into cheese and butter are given below:—

<i>Product</i>	<i>Price per Gallon</i>
Cheese, other than soft curd and cream cheese and Stilton cheese, manufactured from milk delivered in (a) months Oct., 1936, to Feb., 1937, and Sept., 1937.	The weighted average less 1 $\frac{1}{4}$ d. of (1) the average price per lb. for the previous month of the Finest White New Zealand cheese, and (2) the average of (a) the average price per lb. for the previous month of Finest White Canadian Cheese (excluding old and exceptional quotations), and (b) the average price for the previous month of Finest White Canadian cheese New Season's Make. The "weights" to be used are the total imports of New Zealand and Canadian cheese respectively in the month preceding the "previous month."

* See this *Journal*, July, 1936, page 353, and September, 1936, page 567.

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<i>Product</i>	<i>Price per Gallon</i>
(b) Other months.	The average price per lb. for the previous month of Finest White New Zealand cheese, less $1\frac{1}{4}d.$
Stilton cheese.	$1d.$ more than the prices for other hard cheese calculated as above.
Soft curd and cream cheese.	$7\frac{1}{2}d.$
Butter manufactured elsewhere than in Cornwall.	The weighted average price per cwt. in the previous month of New Zealand Finest, Australian Choicest and Danish butter, less $16s.$ per cwt., divided by 265 from October, 1936, to February, 1937, and in September, 1937, and by 285 from March to August, 1937, plus $\frac{1}{10}$ th of a penny, subject to a minimum of $3\frac{1}{2}d.$
	The "weights" to be used are the total imports of New Zealand, Australian and Danish butter respectively in the month preceding the "previous month."
Butter manufactured in Cornwall.	The above weighted average price of imported butters less $16s.$ per cwt., divided by 225 from October, 1936, to February, 1937, and in September, 1937, and by 245 from March to August, 1937, plus $\frac{1}{10}$ th of a penny, subject to a minimum of $3\frac{1}{2}d.$

The prices for milk manufactured into condensed milk for home consumption and into milk powder are $6d.$ and $5\frac{1}{2}d.$ per gal. respectively, plus, in each case, the excess over $4\frac{1}{2}d.$ of the simple average of the prices to be paid for milk manufactured into hard cheese (other than Stilton) during the preceding three months. The price of milk for tinned cream is to be increased by $\frac{1}{2}d.$ to $6\frac{1}{2}d.$ during the period January-September, 1937. Other prices are unchanged from the previous year.

A premium of $1d.$ per gal. over the above-mentioned prices is to be paid for milk used for manufacture in the Metropolitan Police district or the City of London. For milk manufactured in other towns and cities, with more than 60,000 population, into a product for which the scheduled price is less than $7\frac{1}{2}d.$ per gal., a premium of $\frac{1}{2}d.$ per gal. or such lesser sum as will bring the price up to $7\frac{1}{2}d.$ per gal. is payable.

The level delivery premiums of $1d.$ and $\frac{1}{2}d.$ per gal. for exact daily deliveries and daily deliveries with a maximum variation of 10 per cent. are continued. In compliance with the Minister's request, the contract now permits the parties to agree at the time when it is made whether short deliveries on any day shall be penalized by the loss of the premium on the whole of the day's delivery or by payment by the vendor of $2d.$ per gal. on the amount of the deficiency.

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Appropriate minimum retail prices are again prescribed at the rates previously operating, and there is provision for sales at the farmhouse door being made at 1d. per qrt. less than the appropriate minimum.

Prices, etc., for August, 1936. Pool prices and gross rates of producer-retailers' contributions for August, 1936, are given below, with comparative figures for July, 1936, and August, 1935. The wholesale liquid milk price was 1s. 1d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	August 1936 d.	July 1936 d.	August 1935 d.	August 1936 d.	July 1936 d.	August 1935 d.
Northern ..	9½	9½	10	3	3	2½
North-Western ..	9½	9½	10	3	3	2½
Eastern ..	10	10	10½	2½	2½	2½
East Midland ..	9½	9½	10	2½	2½	2½
West Midland ..	9½	9½	9½	3	3	2½
North Wales ..	9½	9½	10	3	3	2½
South Wales ..	9½	9½	10½	3	3	2½
Southern ..	10	10	10½	2½	2½	2½
Mid-Western ..	9½	9½	9½	3	3	2½
Far-Western ..	9½	9½	9½	3	3	2½
South-Eastern ..	10½	10½	10½	2½	2½	2½
Unweighted Average	9·70	9·68	10·05	2·85	2·86	2·53

The pool prices and producer-retailers' contributions do not make allowance for any premiums earned by individual producers for special services or level deliveries, nor for the accredited producers' premium of 1d. per gal.

The number of accredited producers was 18,035 and the sum required for the payment of the premium to them was equivalent to a levy of 0·347d. per gal. on all milk.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, compared with 1½d. per gal. in August, 1935. A levy of ½d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	August 1936 (estimated) Gal.	August 1935 Gal.
Liquid	45,820,956	45,033,627
Manufacturing	34,179,538	25,619,893
	<hr/> 80,000,494	<hr/> 70,653,520
Percentage liquid sales ..	57·28	63·74
Percentage manufacturing sales	42·72	36·26

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The average realization price of manufacturing milk during August was 5·256*d.* per gal. compared with 5·73*d.* per gal. for August, 1935. The quantity of milk manufactured into cheese on farms was 2,519,131 gal. compared with 2,712,414 gal. in July and 1,843,149 gal. in August, 1935.

Farmhouse Cheese. The Board have agreed to make payments to producers who convert milk of their own production into cheese during the year October, 1936, to September, 1937, at the following rates per gal. of milk so used :—

	<i>Milk converted into :—</i>	
	<i>Hard Cheese</i>	<i>Caerphilly or Soft Cheese</i>
October, 1936, to April, 1937	4½ <i>d.</i>	4 <i>d.</i>
May to September, 1937 ..	3½ <i>d.</i>	3 <i>d.</i>

These prices represent a reduction of 1*d.* per gal. on the corresponding payments for the previous year. Payment is conditional on compliance with conditions similar to those that were in force in the previous year.

Complaint against the Operation of the Scheme. The Committee of Investigation for England have reported to the Minister on a complaint as to the operation of the Scheme made by a Hastings firm, formerly retailers of skim milk. The complainants were aggrieved by the prescription by the Board, as one of the conditions of the allowance of rebates to manufacturers in respect of milk used for manufacture, that skim milk should not be sold for use in liquid form for human consumption, and said that the effect of this prescription had been to deprive them of their supplies of skim milk and to put them out of business. The Committee found that the act complained of was contrary to the interests of the complainants, but that it could not be said to be not in the public interest. In view of the Committee's findings, no action has been taken by the Minister under section 9 (5) of the Agricultural Marketing Act, 1931.

Proposed Amendments of the Scheme. Thirteen objections and one representation relative to the proposed amendments of the Scheme were submitted to the Minister, and, in accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister has directed a public inquiry to be held into the objections. The inquiry will be opened at 10.30 a.m. on Monday, October 26, 1936, at the Middlesex Guildhall, Westminster, London, S.W.1, and will be conducted by Mr. N. L. C. Macaskie, K.C.

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Milk Products Marketing Scheme. The time within which objections and representations may be made with respect to this scheme was extended to September 30, 1936, to meet the request of certain trade organizations for longer time in which to consider the scheme.

Potato Marketing Scheme: Riddle, Regulations. The Board on August 27 made new riddle regulations to operate until further notice. A minimum riddle of $1\frac{1}{2}$ in. has been prescribed for King Edward and Red King, and a riddle of $1\frac{3}{4}$ in. for all other varieties. In Scotland, however, the minimum riddle for Golden Wonder is $1\frac{1}{2}$ in. after September 30, 1936, and for the five weeks ending September 30, 1936, Kerr's Pink had to be dressed over a minimum riddle of 2 in.

Purchase of Potatoes in Scotland. In view of the low prices prevailing for potatoes in Scotland, the Board decided on August 27 to commence buying supplies of Great Scot and maincrop varieties of potatoes suitable for re-sale later in the season. The price offered by the Board is 50s. *od.* per ton for delivery until December 31, 1936, with monthly increases thereafter, and a payment of 30s. *od.* per ton will be made immediately after purchase.

Pigs and Bacon Marketing Schemes: Pig Prices for September, 1936. The basic pig price (Class I, Grade C) for September, 1936, was 11s. 11*d.* per score, compared with 11s. 6*d.* for August. This price is the highest so far reached this year, and was brought about by an increase in the cost of the feeding-stuffs ration as compared with the previous month from 7s. 10*d.* to 8s. 1*d.* per cwt. and to a rise in the ascertained bacon price from 90s. 8*d.* to 95s. 7*d.* per cwt. The realization value of offals declined from 8s. 8*d.* to 8s. 6*d.* per pig.

Sugar-Beet Marketing Scheme. Six objections were submitted relative to the Sugar-Beet Marketing Scheme. In accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed Mr. F. J. Wrottesley, K.C., to hold a public inquiry into the objections. The Inquiry, which will be conducted in accordance with the Agricultural Marketing (Public Inquiry) (Great Britain) Rules, 1932, will be opened at 10.15 a.m. on Thursday, October 8,

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1936, at the Middlesex Guildhall, Westminster, London, S.W.1.

Supplies and Prices of Maincrop Potatoes in the 1935-36 Season: Supplies. The situation with regard to the supply of maincrop potatoes in the 1935-36 season was in marked contrast with that in 1934-35, when the home crop was well above average and import requirements were virtually negligible. In 1935-36, both the acreage under potatoes in Great Britain and the estimated yield per acre showed a considerable decline compared with the previous season and the average of the preceding ten years, and the total production of potatoes was lower than in any season since 1931-32.

In these circumstances, no special measures were found necessary by the Potato Marketing Board for regulation of the marketing of home-grown potatoes. Apart from the first three months of the season, when it was required that potatoes for home consumption must pass over a minimum riddle of $1\frac{1}{8}$ in., the basic minimum riddle of $1\frac{1}{2}$ in. was in operation throughout. The Potato Marketing Board also made provision, in special cases, for the sale for human consumption of potatoes slightly below the ordinary minimum standard of size.

In consequence of the short home-crop, shipments to Great Britain from Northern Ireland and imports into the United Kingdom were considerably greater than in the previous season. Even so, the total available supplies of maincrop potatoes were about 450,000 tons (12 per cent.) lower than in the three preceding seasons, but were very similar to the quantities available in 1930-31 and 1931-32.

The following table shows, for each of the past six seasons, the estimated total production of potatoes in Great Britain and the maincrop supplies available for home consumption after deducting first earlies, exports and seed, and adding shipments to Great Britain from Northern Ireland and imports into the United Kingdom.

		<i>Total Production (ooo tons)</i>		<i>Approximate Net Maincrop Supplies* (ooo tons)</i>
1930-31	.. ..	3,603	.. ..	3,180
1931-32	.. ..	3,154	.. ..	3,270
1932-33	.. ..	4,450	.. ..	3,740
1933-34	.. ..	4,555	.. ..	3,750
1934-35	4,464	3,740
1935-36	3,765	3,290

* Including wastage and livestock feed.

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Regulation of Imports. Imports of potatoes into the United Kingdom were controlled, as in the previous season, under the Potato (Import Regulation) Order, 1934. In view of the general shortage of potatoes on the Continent, however, and the relatively high prices ruling in the exporting countries, imports did not, in fact, reach the maximum quantities permitted under the Order.

In the early part of the season, home-produced supplies were considered adequate for all purposes, and only nominal import quotas were prescribed for the months of September, October and November. A sharp rise in prices in December, however, necessitated the release of an emergency quota. In the succeeding three months, imports were on a considerable scale, but were substantially less than the total permitted quantities. In these circumstances, the importing interests applied to the Import Duties Advisory Committee for the remission of the duty of £1 per ton on imports of maincrop potatoes from foreign countries and the Irish Free State, on the ground that the duty made importation unremunerative. The Committee recommended the temporary remission of the duty, and it was accordingly removed on March 26. Imports in April and May showed a considerable increase on previous months, as supplies of home-grown potatoes were being rapidly exhausted. With the advent of the new season's supplies, however, the exceptional situation was considered to have passed, and, on the recommendation of the Import Duties Advisory Committee, the normal duty of £2 per ton on all potatoes became payable on July 1.

Over the whole season from September 1, 1935, to June 30, 1936, imports amounted to about 123,000 tons.

The following table shows imports of maincrop potatoes into the United Kingdom in each month of the 1935-36 season compared with the two previous seasons:—

			1933-34	1934-35	1935-36
			Tons	Tons	Tons
September	..	..	1,000	200	100
October	..	..	2,600	1,700	800
November	..	..	3,600	700	1,000
December	..	..	2,700	500	5,700
January	..	..	2,400	1,500	21,800
February	..	..	1,300	500	17,200
March	..	..	1,200	1,100	18,900
April	700	400	24,000
May	900	500	26,400
June	500	1,400	7,300
			<u>16,900</u>	<u>8,500</u>	<u>123,200</u>

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Northern Ireland Supplies. Shipments from Northern Ireland to Great Britain showed a very considerable increase over those of recent years, amounting to 235,000 tons as against 127,000 tons in 1934-35 and 122,000 tons in 1933-34.

Prices. Wholesale prices in 1935-36 were appreciably higher than in any of the three preceding seasons, and were similar to those ruling in 1930-31, when home production and total supplies approximated to those of the past season. The usual seasonal fluctuations during September and the beginning of October were followed by a steady period until the beginning of December. During December, both growers' and wholesale prices rose rapidly, but growers' prices declined during the latter half of January. Conditions remained generally stable from that time until the latter half of April, when growers' prices again rose to about the January levels. During the last few weeks of the season, prices tended to fall away rapidly. The general tendency over the season as a whole, however, was for prices to rise as the smallness of the home crop made itself felt.

The following table shows the average monthly wholesale price of potatoes* in seven of the principal markets in England and Wales during the past three seasons. The wholesale price index, based on prices in the corresponding months of 1911-13, is also given for each month.

<i>Month</i>	1933-34			1934-35			1935-36		
	<i>Per ton</i>	<i>Index</i>		<i>Per ton</i>	<i>Index</i>		<i>Per ton</i>	<i>Index</i>	
	<i>s.</i>	<i>d.</i>		<i>s.</i>	<i>d.</i>		<i>s.</i>	<i>d.</i>	
September	73	6	99	117	0	158	108	6	147
October	79	6	110	109	0	151	109	6	152
November	82	0	115	103	6	146	114	0	160
December	80	0	112	95	0	133	132	6	185
January	79	6	104	92	6	121	154	0	201
February	77	0	100	89	6	116	154	0	200
March	76	0	97	85	0	108	152	0	193
April	81	0	89	86	0	95	149	6	164
May	80	6	90	101	6	113	156	0	174
June	77	6	82	129	0	137	150	6	160
Mean	78	6	100	101	0	128	138	0	174

* Average of 1st and 2nd qualities Majestic and King Edward.

Retail prices were appreciably higher than in the three previous seasons, but did not fully reflect the rise in wholesale prices. The averages of the monthly retail indices from September to May in the four seasons 1932-33, 1933-34, 1934-35 and 1935-36 were 113, 108, 124 and 148 respectively.

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Milk Acts, 1934 and 1936: *Manufacturing Milk.*
Advances made by the Ministry up to September 15, 1936,
in respect of manufacturing milk were as follows:—

Section		Period of Manufacture	Gallons	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936	453,689,826	2,142,371
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to March, 1936	32,236,042	175,755
	Total for England and Wales		488,499,530	2,330,976
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to June, 1936	49,834,818	330,268
	TOTAL ..		538,334,348	2,661,244

Milk in Schools Scheme. Exchequer contributions up to September 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 40,096,574 gal. of milk to schoolchildren at reduced rates during the months October, 1934, to June, 1936, amounted to £755,582. From October, 1935, to June, 1936, 17,246,829 gal. of milk were consumed as compared with 18,583,101 gal. in the corresponding months of the first year of the scheme.

Revised Arrangements were submitted by the Board and approved by the Minister on August 19 to bring within the scope of the scheme the following categories of schools analogous to those already eligible:

Elementary Schools recognized by the Board of Education as efficient.

Duke of York's School, Dover.

Elementary Schools under the control of the War Office.

Occupational Centres for mentally defective children under the age of 16, and

Residential Poor Law Schools.

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Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 to 1936 (whether by the Exchequer to Milk Marketing Boards, or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·89*d.* per lb. for the month of September, 1936. This exceeds the Standard price for the month under the Acts, and no advances, therefore, will be payable in respect of milk manufactured in Great Britain during September.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted by September 15 to £7,600,824. These payments were in respect of 3,210,199 animals, the average payment per beast being £2 7*s.* 4*d.* Some 961,000 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the Marking of Imported Cattle Orders, 1934 and 1935.

Wheat Act, 1932: Sales of Home-grown Wheat—Cereal Year, 1936-37. Certificates lodged with the Wheat Commission by registered growers during the period August 1 to September 4, 1936, cover sales of 284,742½ cwt. of millable wheat, as compared with 1,848,112 cwt. in the corresponding period (to September 6) in the last cereal year.

Ascertained Average Price of Home-grown Millable Wheat in 1935-36. After consultation with the Wheat Commission, the Minister has made the Wheat (Ascertained Average Price) Order, 1936, certifying and prescribing that, during the cereal year ended July 31, 1936, registered wheat growers sold 33,650,000 cwt. of millable wheat of their own growing at an average price of 5*s.* 9·231*d.* per cwt.

Final Deficiency Payment to Wheat Growers for 1935-36. The Wheat Commission dispatched cheques on September 11 to 92,626 registered growers in respect of the final payment of deficiency payments for the cereal year 1935-36. The aggregate amount involved was approximately £1,193,000, but, after adding 1,098 further payments in relation to which, for various reasons, the Commission have had to investigate the title of persons claiming deficiency payments, the amount disbursed in this final payment will be about £1,229,000.

This will bring the total deficiency payments for the year, including the advance payments made in December, 1935,

MARKETING NOTES

and in February, April and July, 1936, to approximately £5,644,000, or an average of just over £60 per registered grower. The deficiency payment for 1935-36 is equivalent to 3s. 4·26d. per cwt. (approximately 15s. 1d. per quarter) in respect of all sales of wheat credited to growers for that year from wheat certificates delivered to the Wheat Commission.

Approximately 33,650,000 cwt. of millable wheat were sold by the 93,724 growers who have qualified for deficiency payments, and 209,511 certificates relating to the sales of this wheat were delivered to the Wheat Commission.

Fat Stock : Carcass Sale by Grade and Dead-weight. During the eight months to August 31, 1936, over 3,000 separate quotations were issued by the Ministry's graders for stock offered under the Grade and Dead-weight Scheme. In the same period, 6,766 cattle, 22,459 lambs and sheep and 5,452 pigs were dealt with, as compared with 6,955 cattle, 15,783 lambs and sheep and 2,583 pigs received in the first eight months of 1935.

Cattle were mainly consigned to the Birmingham and Yorkshire grading centres, which also dealt with about 50 per cent. of the sheep. Manchester and Liverpool, other important centres for sheep, dealt with a total of 8,769 during this period. Of the total of 5,452 pigs consigned under the scheme, 2,601 were sent to London. This figure exceeds the total number of pigs dealt with under the scheme in London during the whole of 1935.

The following table shows the grading of the carcasses at all grading centres during the period from January to August, 1936:—

Class of Stock	Carcass Grade				Un-graded	Total
	Super*	I	II	III		
<i>Cattle.</i>						
Bullocks and Heifers	48	1,881	3,604	438	56	6,027
Other classes ..	—	197	367	131	44	739
<i>Sheep.</i>						
Lambs	—	6,942	7,226	1,631	596	16,395
Other sheep	—	3,348	2,053	456	207	6,064
<i>Pigs.</i>						
Pork pigs and sows	—	2,884	2,210	280	78	5,452

* This grade is for bullocks and heifers only.

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An interesting feature of the arrangements recently completed for dealing with fat stock from Northern Ireland under the scheme is that all such stock is offered through the local branches of either the Ulster Agricultural Organization Society or the Ulster Farmers' Union. Producers are thus enabled to secure the benefits of consigning in bulk.

Demonstrations at Shows and Exhibitions. Fruit grading demonstrations, as well as exhibits of National Mark produce, will be staged at the Marden and District Commercial Fruit Show on October 7 and 8, and at the Imperial Fruit Show, Renshaw Hall, Liverpool, from October 30 to November 7. Demonstrations of apple packing will be given at the Norfolk Fruit Show, Norwich, on October 16 and 17.

At the Dairy Show to be held at the Royal Agricultural Hall, London, from October 20 to 23, the Ministry's exhibit will consist mainly of National Mark dairy produce—butter, eggs, and various types of cheese.

OCTOBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

OCTOBER, like the preceding month, is a time of great activity on arable land, much of the winter cereals and beans having to be sown, and harvesting of the root crops being in full swing. While a break in the weather at this time of year has serious consequences on most arable farms, the effects are particularly felt on the heavier land, where wheat has to be sown and the mangold crop carted off.

Potatoes. The recent prices ruling for potatoes are disappointing, but the existence of the Potato Marketing Board gives justification for the hope that the position may be righted by the time the crop is taken out of the clamps. In addition, reports of light crops from many districts indicate that prices may be very different before spring. An interesting criticism of the Board's riddle regulations was heard last year in a Midland county. The complaint was made that, with a large riddle in force, a large proportion of the crop in that county passed through the riddle, while the Lincolnshire growers were able to sell most of their crop. On being asked whether a smaller riddle would be more just to his county, this grower complained that that would be equally unfair, since buyers would prefer to buy in Lincolnshire, where the produce would contain more large tubers! One cannot envy the position of a Board that is expected to be able to adjust the position arising through some districts growing more marketable potatoes than others!

The lifting of the potato crop is much simplified by the various ploughs and spinners that are now in general use. Many express surprise, however, that a fairly large proportion of the crop should be dug by the "graiip." The graip, or potato fork, in the hands of an efficient user in light land can put up a very good account of itself; this can be realized when observing a number of Irish workers specially organized and selected for this work. The proportion of the crop that is hand-raised is smaller, however, in the main crop than in the earlier crop. This is probably due to the smaller size and greater value of the tubers of the earlier crop, making it important that no tubers should be left covered by the soil. In addition, a greater proportion of the first and second

SELECTED CONTENTS OF PERIODICALS

Field Crops, etc.

- The Influence of Management on the Chemical Composition of Pastures in Winter. *T. W. Fagan*. (Welsh J. Agric. 12 (Jan., 1936), pp. 136-139.)
- The Yield and Composition of Cut Pasture Herbage at Different Times of the Day. *A. W. Greenhill*. (Emp. J. Exp. Agric. (July, 1936), pp. 274-282.)
- Pasture Management and its Effect on the Sward. Part III. A Poor *Agrostis* Pasture. *L. Iorwerth Jones*. (Welsh J. Agric. 12 (Jan., 1936), pp. 139-157.)
- The Utilisation of Atmospheric Nitrogen by Mixed Crops. Pt. I. *H. Nicol*. (Int. Rev. Agric. Mon. Bull. Agric. Sci. Pract. 27, 6 (June, 1936), pp. 201-216.)
- The Utilisation of Atmospheric Nitrogen by Mixed Crops. Part II. *H. Nicol*. (Int. Rev. Agric. Mon. Bull. Agric. Sci. Pract. 27, 7 (July, 1936), pp. 241-256.)
- The Lamb Fattening Capacity of Certain Crops for Hill Conditions. *M. Griffith* and *P. M. G. Hutton*. (Welsh J. Agric. 12 (Jan., 1936), pp. 120-126.)
- The Effect of Shoot Cutting on the Growth of Root and Shoot of Perennial Rye-Grass (*Lolium perenne*, L.) and of Timothy (*Phleum pratense*, L.). *R. A. Roberts* and *I. V. Hunt*. (Welsh J. Agric. 12 (Jan., 1936), pp. 158-174.)
- Length of the Dormant Period in Cereal Seeds. *A. H. Larson*, *R. B. Harvey* and *J. Larson*. (J. Agric. Res. 52, 11 (June, 1936), pp. 811-836.)
- The Effects of Tar on the Germination of Wheat Seed. *H. A. Lafferty*. (J. Dept. Agric. Irish Free State, 34, 1 (June, 1936), pp. 63-72.)
- An Examination of the Sampling Observations on Wheat of the Crop-Weather Scheme. *M. M. Barnard*. (J. Agri. Sci. 26, 3 (July, 1936), pp. 456-487.)
- World Wheat Utilization since 1885-86. *M. K. Bennett et al.* (Wheat Stud. Stanford University, 12, 10 (June, 1936), pp. 339-391 + appendix.)
- Two New Varieties of Hops: "Fillpocket" and "Quality Hop," *E. S. Salmon*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 38-47.)
- The Cultivation of the Cricket Bat Willow, *Salix Cærulea*, on Sewage Farms. *H. P. Hutchinson*. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 217-219.)
- Quantitative Observations on the Fixation and Transfer of Nitrogen in the Soya Bean, with Especial Reference to the Mechanism of Transfer of Fixed Nitrogen from *Bacillus* to Host. *G. Bond*. (Ann. Bot. Lond., 50, 199 (July, 1936), pp. 559-578.)
- Investigations in Crop Husbandry. IV. The Preparation of the Seed Bed for Wheat after Potatoes. *F. H. Garner* and *H. G. Sanders*. (J. Agric. Sci. 26, 3 (July, 1936), pp. 415-423.)
- Physiological Studies in Plant Nutrition. V. Carbohydrate Metabolism in Relation to Nutrient Deficiency and to Age in Leaves of Barley. *F. G. Gregory* and *E. C. D. Baptiste*. (Ann. Bot., Lond., 50, 199 (July, 1936), pp. 579-619.)
- Vernalization: Its Principles and Practice. *M. Caffey* and *P. T. Carroll*. (J. Dept. Agric., Irish Free State, 34, 1. (June, 1936), pp. 53-62.)

- Bacterial Canker of Plum Trees in Relation to Nutrition: Experimental Results in Sand Cultures. *F. H. Beard and H. Wormald*; and Appendix by *W. A. Roach*. (Rep. E. Malling Res. Stn. (1935), pp. 146-154 + 1 p. plate.)
- A Note on the Occurrence of New Virus Diseases of the Tomato in the Bristol Province. *L. Ogilvie*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 104-106.)
- Poisonous Plants, with Special Reference to the Poisonous Properties of Bracken (*Pteridium aquilinum*). *K. W. Braid*. (Scott. J. Agric. 19, 3 (July, 1936), pp. 247-251.)
- Mineral Oils as Mosquito Larvicides. *D. R. P. Murray*. (Bull. Ent. Res. 27, 2 (July, 1936), pp. 289-305.)
- The Eradication of Weeds in Cereal Crops by Sulphuric Acid and other Compounds. *G. E. Blackman* and *W. G. Templeman*. (J. Agric. Sci. 26, 3 (July, 1936), p. 368-390.)
- Pyrethrum. *S. G. Jary*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 59-66.)
- The Use of Derris Root as an Insecticide. *W. Steer*. (Rep. E. Malling Res. Stn. (1935), pp. 225-227.)
- Some Metallic and Inorganic Compounds used as Weed Killers. (Bull. Imp. Inst., London, 34, 2 (April-June, 1936), pp. 189-211.)
- Chemical Control of Harmful Fungi during Stratification and Germination of Seeds of *Ribes vesce*. *C. R. Quitch*. (Phytopathology, 26, 7 (July, 1936), pp. 694-697.)
- Some Physiological Effects of Oil Sprays upon Deciduous Fruit Trees. *M. W. Black*. (J. Pomol., 14, 2 (July, 1936), pp. 175-202 + 4 plates.)
- Field Trials in 1935 of the Fungicidal and Phytocidal Properties of Certain New Chemical Preparations. *H. B. S. Montgomery*, *M. H. Moore* and *H. Shaw*. (Rep. E. Malling Res. Stn. (1935), pp. 198-203.)
- A Field Spraying Trial of Combined Fungicide-Contact-Insecticide Sprays in 1935. *M. H. Moore* and *H. B. S. Montgomery*. (Rep. E. Malling Res. Stn. (1935), pp. 191-197.)
- Investigations on Egg-killing Washes. The Ovicidal Properties of Lauryl Rhodanate. *H. G. H. Kearns* and *H. Martin*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 37-48.)
- The Effect of Calcium Cyanamide on Pea and Potato "Sickness." *C. L. Wallon*, *L. Ogilvie* and *P. W. Brian*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 91-97.)
- The Comparative Insecticidal Efficiency against the Camphor Scale of Spray Oils with different Unsulphonatable Residues. *A. W. Cressman*, *L. H. Dawsey*. (J. Agric. Res. 52, 11 (June, 1936), pp. 865-878.)
- Determination of Fumigants. IV. Detection and Determination of Residues of Hydrogen Cyanide. *A. B. P. Page* and *F. P. Gloyns*. (J. Soc. Chem. Ind., London, 55, 31 (July 31, 1936), pp. 2137-2171.)
- Determination of Fumigants. V. Determination of Hydrogen Cyanide evolved from Discs of Wood Pulp. *A. B. P. Page* and *F. P. Gloyns*. (J. Soc. Chem. Ind., London, 55, 31 (July 31, 1936), pp. 2137-2171.)

- The Death-Watch Beetle. R. Palmer. (*Estate Mag.* 36, 8 (August, 1936), pp. 581-585).
- Gall Midges affecting Grass Seed Production in Mid-Wales. D. P. Jones. (Welsh J. Agric. 12 (Jan., 1936), pp. 192-197).
- The Control of Gall Midges affecting Seed Production in Grasses. G. Evans and D. P. Jones. (Welsh J. Agric. 12 (Jan. 1936), pp. 198-204).
- Gall Midges (*Cecidomyiidae*) whose Larvae attack Fung. Joan A. T. Anderson. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 95-107).
- Three Weevils of the Genus *Rhynchites* Injurious to Fruit. S. W. Rolfe. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 86-94).
- Studies of Impregnation of Tree Banding Materials. II. Apple Blossom Weevil and Codlin Moth Experiments in 1935. R. M. Greenlade and A. M. Masse. (Rep. E. Malling Res. Stn. (1935), pp. 177-183).
- A Note on the Treatment of Dormant Nursery Stock against Woolly Aphis. R. M. Greenlade. (Rep. E. Malling Res. Stn. (1935), pp. 184-185).
- Observations on Codlin Moth (*Cydia pomonella* L.) in 1935. W. Steer. (Rep. E. Malling Res. Stn. (1935), pp. 186-190).
- Insect Damage to Empty Products. J. W. Munro. (J. Roy. Soc. Arts, 84, 4365 (July 17, 1936), pp. 925-937).
- A Fungus Disease of Stored Potatoes. N. L. Alcock and C. E. Foster. (Scott. J. Agric. 19, 3 (July, 1936), pp. 252-257 + 4 pp. plates).
- Tomato-seedling Damping-off: Control by Soil Treatment. R. M. Brien and E. E. Chamberlain. (N.Z. J. Agric. 52, 5 (May 20, 1936), pp. 257-267).
- Black Rot of Tomato, *Lycopersicon esculentum*, caused by *Alternaria* Sp. Elisabeth E. Warner. (Phytopathology, 26, 6 (June, 1936), pp. 530-549).
- Fungi of Sugar Beets. F. A. Hodges. (Phytopathology, 26, 6 (June, 1936), pp. 550-563).
- Tulip Diseases: *Sclerotium Tuliparum*, *Botrytis Tulipae*. (J. Roy. Hort. Soc. 61, 8 (August, 1936), pp. 352-353).
- Experiments on the Use of Lime in Controlling Finger-and-Toe Disease of Brassicae. T. Whitehead. (Welsh J. Agric. 12 (Jan. 1936), pp. 183-192).
- Stand unserer Kenntnisse vom Löwenmaulrost (*Puccinia antirrhini*, Diet. et Holw.) und seiner Bekämpfung. H. Pape. (Der Forschungsdenkst, 1, 12 (June 15, 1936), pp. 930-938).
- Notes on the Silver Leaf Disease. H. Wornald. (Rep. E. Malling Res. Stn. (1935), pp. 155-157 + 1 p. plates).
- The Verticillium Wilt of Hops. R. V. Harris. (Rep. E. Malling Res. Stn. (1935), pp. 158-162).
- The Incidence of Canker in Young Cider-Apple Trees. E. Umphey and T. Swarbrick. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 98-103).
- Factors influencing Infection of Barley by Loose Smut. R. W. Leukel. (Phytopathology, 26, 7 (July, 1936), pp. 630-642).
- Ein neuer Unkrautpilz auf Champignonbeeten (*Pleurotus Passerianus*, Pilat.). F. Passescher (Z. Pflkrankh. 46, 6 (1936), pp. 271-277).
- The Incidence of "Reversion" in Seedling Black Currants and in Clones derived from them. G. T. Spinks and G. E. Clothier. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 58-66).

SELECTED CONTENTS OF PERIODICALS

- A New Method of Arranging Variety Trials Involving a Large Number of Varieties. *F. Yates*. (J. Agric. Sci. 26, 3 (July, 1936), pp. 424-455.)
- (Int. Rev. Agric. Mon. Bull. Agric. Econ. Soc. (June, 1936), pp. 171-186.)

Agricultural Economics

- Farm Economics in Scotland: The Value of a Type-Classification of Holdings. *W. H. Senior*. (Scott. J. Agric. 19, 3 (July, 1936), pp. 258-264.)
- Causes of the Fall of Agricultural Prices between 1875-1895. *H. M. Conacher*. (Scott. J. Agric. 19, 3 (July, 1936), pp. 239-247.)
- Comparative Productivity and Income Yield of Small Holdings. *J. P. Howell*. (Welsh J. Agric. 12 (Jan., 1936), pp. 46-58.)
- The Financial Results of Different Types of Farms in Wales. *J. P. Howell*. (Welsh J. Agric. 12 (Jan., 1936), pp. 22-46.)
- Farm Aid in Foreign Countries. (Foreign Crops and Markets, 32, 22 (June 1, 1936), pp. 643-684.)

Soils and Fertilizers

- The Determination of Phosphorus in Soils. *W. McLean*. (J. Agric. Sci. 26, 3 (July, 1936), pp. 331-336.)
- Further Studies on the Aspergillus Niger Method of Examining Soils. *A. M. Smith*. (J. Soc. Chem. Indus., Lond., 55, 31 (July 31, 1936), pp. 217-221.)
- The Effect of Applying a Nitrogenous Fertiliser to Wheat at Different Stages of Growth. *D. J. Watson*. (J. Agric. Sci. 26, 3 (July, 1936), pp. 391-414.)
- Some Minor Fertiliser Materials. (Bull. Imp. Inst., London, 34, 2 (April-June, 1936), pp. 212-219.)

Plant Pests, Diseases, etc.

- A Strawberry Disease Resembling the American "Crimp." *L. Ogilvie* and *C. R. Thompson*. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 77-79 + 1 pl.)
- The Control of Woolly Aphis (*Eriosoma lanigernum*, Hausm.) on Nursery Trees. *H. G. H. Kearns* and *E. Umphey*. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 67-75 + 1 pl.)
- Recherches sur le comportement du carpocapse en vue de l'établissement rationnel des traitements insecticides contre cet insecte. *M. P. Marchal*. (C. R. Acad. Agric., France, 22, 22 (July 8, 1936), pp. 783-788.)
- The Control of Flea Beetles by Means of a Seed Dressing. Progress Report. *C. L. Walton*. (Ann. Rept. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 80-86.)
- Studies on the Resistance and Immunity of Apples to the Woolly Aphis, *Eriosoma lanigernum* (Hausm.). *M. B. Crane*, *R. M. Greenhalgh*, *A. M. Massie* and *H. M. Tydemann*. (J. Pomol. 14, 2 (July, 1936), pp. 137-163 + 4 pl.)
- The Raspberry Beetle (*Byllurus tomentosus*) and its Control. *J. Carroll*. (J. Dep. Agric. Irish Free State, 34, 1 (June, 1936), pp. 119-123.)
- The Relation of Aphids to the Transmission of Bean Mosaic. *W. J. Zaunreiter* and *C. W. Kearns*. (Phytopathology, 26, 7 (July, 1936), pp. 614-629.)

An anonymous inquirer, faced with these problems in the opening programme, subjects of agricultural methods, land settlement, urban and rural population, and public health. In the first broadcast on October 9 the subject will be "The Land and the People," and the discussion will be between a townsman, a blacksmith, a schoolmaster, and a retired farm labourer. The second on October 23 will deal with the "Health of the Nation," as it affects both town and country, and will be given by Sir John Boyd Orr and Harry J. Rae, Medical Officer for Aberdeenshire.

§ There will also be a monthly talk by members of the Ministry of Agriculture for Northern Ireland, details of which will be available later.

Market Prices Bulletin. The B.B.C. announces that, in co-operation with the Ministry, the arrangements for the issue of Market Prices for Farmers have been altered.

Henceforward, only one General Bulletin for Farmers will be broadcast in the National programme each week at 6.20 p.m. on Fridays.

On the other hand, the number of local Market Prices Bulletins will be increased, and will be broadcast in the Regional programmes at 7.20 p.m., as under:—

Scotland	..	Tuesdays, Wednesdays, Thursdays and Fridays.
Northern Ireland	..	..
North of England	..	..
Midland	..	..
London and Home Counties	..	..
Wales	..	..
West of England	..	..

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

Scientific Progress in Agriculture. *F. L. Engledow.* (J. Chart. Surv. Instn. 16, 1 (July, 1936), pp. 13-39.)

Changes in the Agricultural Industry of Aberdeenshire in the Last Fifty Years. II. *J. Cruickshank.* (Scott. J. Agric. 19, 3 (July, 1936), pp. 225-239.)

The Case for Land Improvement and Reclamation. *R. G. Stapledon.* (J. Roy. Soc. Arts, 84, 4367 (31 July, 1936), pp. 971-994.)

The Economics of Rural Landowning. *W. C. D. Dampier-Welham.* (J. Proc. Agric. Econ. Soc. 1, 3 (Dec., 1930), pp. 56-75.)

La Coopération agricole. *A. Hulha.* (L'Est Européen Agric. 17 (April, 1936), pp. 105-127.)

Mechanization in British Farming. *S. J. Wright.* (Emp. J. Exp. Agric. (July, 1936), pp. 283-288.)

Rural Migration. *W. H. Jones and J. R. E. Phillips.* (Welsh J. Agric. 12 (Jan., 1936), pp. 5-22.)

Migration and Settlement in Australia, New Zealand and Canada. *D. C. Tait.* (Inter. Lab. Rev. 34, 1 (July, 1936), pp. 34-65.)

Sir John Sinclair. *A. McCallum.* (Scott. J. Agric. 19, 3 (July, 1936), pp. 215-225.)

WIRELESS TALKS TO FARMERS, OCTOBER, 1936

Station and Date	Time : p.m.	Speaker	Subject
National : October 5, 12, 19 and 26	6.20	Mr. Anthony Hurd	Seasonal.
North : October 2	7.30	Mr. W. B. Mercer, Principal of the Cheshire School of Agriculture	A Survey of the South-western part of the Region
October 9	6.40	Mr. H. R. Brooks, Newton Riggs Farm	Gardening for Profit : Small Fruit.*
October 15	7.55	Mr. B. H. Wilsdon (Director of Research, Wool Industries Association, Leeds) and Sir David Rivett	Work in Progress : Wool Research.
October 16	8.40	Mr. A. McVicar, Agricultural Organizer for Lindsay, Lincolnshire	A Survey of North Nottinghamshire, Lincolnshire and the East Riding of Yorkshire.
Midland : October 11	5.50	Mr. Graham Castle	Our Country Correspondent, Gloucestershire.
October 15	6.40	Messrs. W. B. Thompson and R. B. Collier	Dried Grass and its Use.
West : October 8, 22	6.40	Mr. A. W. Ling	For Western Farmers in particular.
Scottish : October 8	6.25	Mr. A. D. Buchanan	Influence of the Proven Sire.
October 9	9.0	A townsman, a blacksmith, a schoolmaster, and a retired farm labourer	The Everlasting Heritage : The Land and the People—Discussion.
October 15	6.30	Mr. R. L. Scarlett	For Scottish Farmers.
October 22	6.40	Mrs. Blair	The Farm Kitchen.
October 23	fixed	Sir John Boyd Orr and Mr. Harry J. Rae	The Everlasting Heritage : The Health of the Nation.
October 29	6.30	Not fixed	For Scottish Farmers.
Northern Ireland : § Fortnightly on Fridays	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.

* The Northern station is broadcasting an experimental series of talks on commercial horticulture, for the benefit of small growers, under the title of "Gardening for Profit." Each talk will be given by an expert, and in the first talk on October 9, at 6.40 p.m., H. E. Brooks, Head of the Newton Riggs Farm School, Penrith, Cumberland, will discuss "Small Fruit."

† "The Everlasting Heritage" is an important series of talks to be given from the Scottish studio, and which should be of considerable interest, not only to the Scottish farming community, but to many others on this side of the Border, for the problems to be discussed are those which affect all parts of the country. The main scheme of the series has been drawn up by Ian Macpherson, author of "Land of Our Fathers," and John R. Allan, author of "Farmer's Boy," and in it the relations between town and country will be fully explored.

and coffee, as well as other tropical and sub-tropical crops, that a consideration of their methods will reflect some degree of similarity with the economic difficulties that confront farmers all over the world in these troublous times. A former handbook of Malayan agriculture was prepared in 1922 and revised in 1924, but owing to difficulties in which the planters and farmers of Malay found themselves, very extensive changes and developments have taken place since that date; and the present treatise is intended to describe the condition of the country in 1935. The major crops, rubber, coconuts, rice, oil palm, pineapples, are treated in detail and the Malayan minor crops in a general manner. Cattle, pigs and poultry form the subject of separate chapters, and the whole is introduced by a section dealing with agricultural conditions, including chapters on land tenure, policy and co-operation of the organization of the various agricultural services. The book should be in the hands of all planters and farmers of Malaya, and will form a very useful work for anyone engaged in the study of tropical agriculture. An additional advantage is that each chapter is supplied with a bibliography for those who wish to pursue their inquiries further.

Agricultural Organization in New Zealand. A Survey of Land Utilization, Farm Organization, Finance and Marketing. By H. Belshaw, Director of Project; D. O. Williams, Joint Editor and Acting Director; F. B. Stephens, Research Assistant; E. J. Rawcett and H. R. Rodwell, Associate Editors. Pp. xx + 818. 21 Maps. (London : Humphrey Milford, Oxford University Press. 1936. Price 21s.)

It would be quite impossible to give a comprehensive survey of this work in the course of a brief notice. It will be sufficient, however, to indicate the value of this contribution by stating its origin and giving a concise summary of its contents. The book is one of a number of surveys in land utilization in various Pacific countries, authorized by the Research Committee of the New Zealand Institute of Pacific Relations. The work has been done by the joint efforts of some thirty specialists, whose work had been carefully planned and correlated over a number of years. It is thus not simply a collection of separate essays, but presents a co-ordinated examination of the foundation, methods and problems of the farming industries in New Zealand and public policy in relation to them.

In planning the book, a broad view of the problem of land utilization has been adopted. The technique of land utilization is conditioned by a wide variety of factors, such as land tenure, transport, markets, price movements, organizations, associations and institutions, as well as by the agricultural arts. Because of their bearing on land utilization, the above and other problems, which may be grouped broadly under the general heading of organization, have been dealt with as adequately as possible.

Broadly, the book is divided into four main headings: 1, Introductory; 2, General factors affecting land utilization in New Zealand; 3, Organization of Farming; 4, Processing and Marketing. Under each of these heads a number of essays by specialists in particular departments is included, the general nature of which has already been indicated. The publishers claim that the volume is the only authoritative and comprehensive survey of land utilization and agricultural organization which has so far been attempted in New Zealand, and, from that point of view alone, it is essential to the understanding of the development of the present position of agriculture in that country.

the same time, imports of butter increased even more rapidly than before the war. The chief innovation in the post-war organization of the market was, of course, the introduction of the collective bargaining system for the determination of producers' prices, and the resulting differentiation between the prices payable for milk sold to the liquid market and that destined for manufacture.

As regards the relative profitability of sale to the liquid market and of conversion to butter or cheese, however, Miss Cohen finds that there was no substantial difference in favour of liquid milk, either before the war or after it, up to 1929, for farmers between 100 and 150 miles from London. This is the zone where the most important butter and cheese producing areas close to London are to be found. Average figures for the country as a whole, published by the Reorganization Commission (p. 43 of their report), showed a difference in favour of liquid milk of nearly 4d. per gallon in 1913 and of nearly 6d. in 1922-3. In an area, however, where production of liquid milk and conversion to butter and cheese go on side by side, a permanent difference of any magnitude would be inexplicable as long as individual farmers retained their freedom to dispose of their milk in the most profitable way. Miss Cohen concludes, therefore, that, up to 1929, the collective bargaining system probably did not operate to raise artificially the level of liquid as compared with manufacturing prices. When, after 1929, it attempted to maintain the contract price of liquid milk in spite of the fall in butter and cheese prices, the level of liquid prices and the continuance of organized bargaining itself were alike jeopardized by the danger of a large-scale diversion of milk from the manufacturing to the liquid market.

Miss Cohen agrees that some form of intervention was justified at this stage, for, the industry having been expanded in the years since 1929 by the maintenance of liquid prices, the disappearance of organized marketing would have meant a disastrous fall in prices, sufficient perhaps to threaten a subsequent shortage of milk. But the marketing scheme as it has been operated does not escape her criticism. Retail prices, she finds, have been raised to some extent, more especially in the smaller towns and rural districts, and the increase in consumption has been thereby checked. With the present consumption of liquid milk, pool prices are probably well above the level necessary to maintain an adequate supply. "It is not right that the production of milk to be made into factory cheese at home should be permanently subsidized by paying farmers at least 4d. per gallon more for their milk than it can realize in this outlet." Under present conditions, an increase in efficiency in the overseas countries might even lead to an increase in liquid prices, for the Board might be tempted to increase liquid prices in order to counteract the effects of a fall in the price of manufactured products. Further, the pooling arrangements and the regulations as to transport deductions are likely to encourage an uneconomical geographical distribution of the industry, involving the transport of liquid milk for unnecessary distances.

The story is, of course, in its main outlines a familiar one, but Miss Cohen's material is more comprehensive and her analysis more thorough than any hitherto available. The book will take its place as one of the essential works on the subject.

An Outline of Malayan Agriculture. By D. H. Crist. Pp. xiii + 377. 2 Maps and 86 Figs. (Kuala Lumpur, Straits Settlements: Department of Agriculture, 1936. Price 7s.)

The practice of Malayan agriculture is not a subject that is likely to be of immediate practical service to farmers of Great Britain, but so much has been heard of the troubles which affect the growers of rubber, tobacco

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND
Cornwall: Mr. R. Gardner, N.D.H., has been appointed Head Gardener and Instructor at the Culval Experimental Station, *vice* Mr. H. W. Sayer.
Hertfordshire: Mr. M. Cair has been appointed Poultry-keeping Instructor, *vice* Mr. D. W. Ferguson.
Kent: Mr. R. Hart, N.D.H., N.D.A., has been appointed Principal of Borden Farm Institute, *vice* Mr. T. W. McDougall-Porter, M.C., N.D.A.
Commercial Fruit Growing, *vice* Mr. R. Hart.
Mr. E. Middleton has been appointed Recorder of Egg Laying Trials, *vice* Mr. K. A. Clark.
COUNTY AGRICULTURAL EDUCATION STAFFS: WALES
Monmouthshire: Miss M. A. Price, B.Sc., has been appointed Assistant Instructor in Rural Domestic Economy.

NOTICES OF BOOKS

The Tithe Act, 1936. By E. Lawrence Mitchell, C.B.E. Pp. 36. (London: Published jointly by the Land Agents' Society, the Central Land-owners' Association and the Chartered Surveyors' Institution. 1936. Price 1s. 6d.)
 This brochure is a reprint of an article by the Secretary of the Royal Commission on the Tithe Rentscharge, which appeared in a recent issue of *The Journal of the Land Agents' Society*. The salient features of the new measure are explained, and there is a table for calculating the amount of a redemption annuity in respect of tithe rentscharge. Land and tithe owners and other persons affected by the Act will find this a useful and authoritative guide to its provisions.

The History of Milk Prices: an Analysis of the Factors affecting the Prices of Milk and Milk Products. By Ruth L. Cohen. Pp. xiii + 205. (Oxford: Agricultural Economics Research Institute. 1936. 5s.)
 In this book, Miss Cohen gives a history of the milk market in England from pre-war times to the present day. She traces the course of milk and milk-product prices since 1906, and analyses the growth of the import trade in dairy products from 1886 onwards. She discusses the changes in production at home and abroad, and attempts to determine the relative influence of supply and demand on the course of prices. She does not discuss in detail the economics of the retail distribution of milk and milk products, but, with this limitation, her study is the most complete that has yet appeared.
 During the pre-war period, consumption of liquid milk was expanding; between 1890 and 1907-08 there was an increase of over 50 per cent. in total consumption and of 33 per cent. in consumption per head. Retail prices in London (the only series available) remained stable from 1892 to 1915 at 1s. 4d. per gallon (though 1s. 8d. was also paid in the winter of 1911-12). Increased production of liquid milk was associated with a decline in home production of butter and cheese and a large increase in imports of these products, especially of butter.
 In the post-war period, the increase in consumption of liquid milk per head was much slower, and the retail price was high relative to retail prices in general. Since total dairy production was increasing, the production of milk products increased relatively to that of liquid milk. At

PRELIMINARY STATEMENT compiled from the Returns collected on June 4, 1936, showing the ACREAGE under Hops in each COUNTY OF ENGLAND in which Hops were grown, with a COMPARATIVE STATEMENT for the Years 1935 and 1934.

STATEMENT for the Years 1935 and 1934.

* Dismissed under Probation of Offenders Act.

Agricultural Returns of England and Wales, 1936:

PRELIMINARY STATEMENT compiled from the Returns collected on June 4, 1936, showing the ACREAGE under Hops in each COUNTY OF ENGLAND in which Hops were grown, with a COMPARATIVE STATEMENT for the Years 1935 and 1934.

STATEMENT for the Years 1935 and 1934.

* These figures include the acreage left unpicked which was estimated in 1935 to be about 632 acres and in 1934 about 270 acres.

that on which the existing rates are due to expire), and to continue in operation until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 35s. per week of 48 hours in winter, except in the week in which Christmas Day falls, when the hours are 39½, and 50 hours in summer, except in the weeks in which Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 41. For horsemen, cattlemen and shepherds of similar age, inclusive weekly sums are fixed to cover all time worked in excess of the number of hours mentioned above, except employment which is to be treated as overtime employment. The overtime rates for male workers of 21 years of age and over are 10½d. per hour on Saturdays (or on any other day agreed as the weekly short day), 1s. 1½d. per hour on Sundays and on Christmas Day, 8½d. (instead of 8d. as at present) per hour on Easter Monday, Whit Monday and August Bank Holiday, and 9d. per hour for all other overtime employment. The minimum rate for female workers of 15 years of age and over is 6d. per hour, with overtime at 7d. per hour for all employment in excess of 5½ hours on Saturday or other agreed weekly short day, on Sundays, and in excess of 8 hours on any other day.

Oxfordshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution thereof to come into force on September 27, 1936 and to continue in operation until October 3, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in summer, except in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall, when the hours are 31, with overtime throughout the period at 10d. (instead of 9½d. as at present) per hour, on weekdays and 1s. (instead of 11½d. as at present) per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day. The minimum rates for female workers of 18 years of age and over remain unchanged at 6½d. per hour, with overtime at 8d. per hour on weekdays and 9½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day.

Pembroke and Cardigan.—An Order fixing minimum and overtime rates of wages to come into force on October 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until September 30, 1937. The minimum rate for male workers of 21 years of age and over is 31s. (as at present) per week of 52 hours in winter and 54 hours in summer, with overtime unchanged at 8d. per hour. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour for 8 hours per day throughout the year with overtime payment on weekdays, at 6d. per hour and on Sundays at 6½d. per hour for the first three hours and 7½d. per hour for subsequent hours.

Rathor and Brecon.—An Order continuing the operation of the existing minimum and overtime rates of wages from November 1, 1936 (i.e., the day following that on which the existing rates are due to expire) until April 30, 1937. The minimum rates for male workers of 21 years of age and over are 31s. per week of 50 hours in winter and 54 hours in summer, with overtime at 9d. per hour. For female workers of 18 years of age and over, the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

meals, hotel accommodation where necessary, special train and excursions, has been fixed at £295 (sterling) first-class throughout, and £259 (sterling) second-class on ship only. An illustrated brochure containing full particulars, itinerary, dates, etc., may be obtained on application to Major-General F. J. Duncan, Organizing Secretary, The British National Union (Inc.), 9, Arlington Street, London, S.W.1.

Foot-and-Mouth Disease. An outbreak of Foot-and-Mouth Disease was confirmed on September 6 at Nuthurst, Horsham, West Sussex. The usual restrictions were imposed over an area in East and West Sussex and Surrey of approximately 15 miles radius round the infected premises. This is the first outbreak of the disease in Great Britain for over seven months, the last confirmed outbreak being on January 26.

An order was issued confining the Infected Area to approximately five miles round Nuthurst as from September 21, and, provided the disease position remains satisfactory, the area will be finally freed from Foot-and-Mouth disease restrictions as from September 28.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, September 22, 1936. The Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :

Gloucestershire.—An Order fixing minimum and overtime rates of wages to come into force on October 5, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 3, 1937. The minimum rates for male workers of 21 years of age and over are as follows : (a) head carters, 36s. 6d. (instead of 35s. 6d.) per week of 58 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 51, and 38s. (instead of 37s.) per week of 60 hours in winter, except in the week in which Christmas Day falls, when the hours are 52½; (b) head shepherds and head stockmen, 38s. (instead of 37s.) per week of 60 hours, except in the weeks in which Christmas Day, Good Friday and Whit Monday fall, when the hours are 52½; (c) under carters, 34s. 6d. (instead of 33s. 6d.) per week of 54 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 48, and 36s. 6d. (instead of 35s. 6d.) per week of 57 hours in winter, except in the week in which Christmas Day falls, when the hours are 50½; (d) under shepherds and under stockmen, 36s. 6d. (instead of 35s. 6d.) per week of 57 hours, except in the weeks in which Christmas Day, Good Friday and Whit Monday fall, when the hours are 50½; and (e) other male workers, 32s. (instead of 31s.) per week of 50 hours in summer, except in the weeks in which Good Friday and Whit Monday fall, when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day falls, when the hours are 39½. Provision is made for an adjustment of the hours in respect of which the minimum rate is payable in the week preceding Whitsun week to meet cases where a holiday is given in that week instead of in the week in which Whit Monday falls. The overtime rates for all male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays, Christmas Day, Good Friday and Whit Monday. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour.

Lincolnshire (Holland).—An Order fixing minimum and overtime rates of wages to come into force on October 25, 1936 (i.e., the day following

of agriculture or agricultural colleges for degree or diploma courses in an agricultural subject; 14 Extended Junior Scholarships, not exceeding one year in duration, for advanced or specialized courses of instruction at farm institutes or agricultural colleges; and 110 Junior Scholarships tenable at farm institutes and similar institutions, for courses not exceeding one year in agriculture, horticulture, dairying or poultry husbandry, or in a combination of two of these subjects.

The following obtained Senior scholarships:—

For Degree Courses :

HANNAH E. BEVAN (Monmouthshire Institute of Agriculture) to Reading University.
JOHN R. JUDSON (Cumberland and Westmorland Farm School) to Armstrong College, Newcastle-on-Tyne.
JOHN H. KITCHIN (Hertfordshire Institute of Agriculture) to Reading University.
MARJORIE E. MIXTER (East Anglian Institute of Agriculture) to Reading University.
MARGARET NORRIS (Brigg Girls' High School) to The Horticultural College, Swanley.
WILLIAM J. A. FAYNE (Prince Henry's Grammar School, Evesham) to Downing College, Cambridge.
MARGARET N. B. WILSON (Letchworth Grammar School) to The Horticultural College, Swanley.

For Diploma Courses :

GEORGE A. GOWLAND (Northamptonshire Institute of Agriculture) to Leeds University.
MARGARET HOLLAND (Monmouthshire Institute of Agriculture) to Harper Adams Agricultural College.
RAY C. WATERS (Midland Agricultural College) to return to The Midland Agricultural College.

Empire Primary Producers' Tour, 1936-37.—The 14th tour organized by the British National Union will include a visit to India and Ceylon. These tours have as an object the promotion of friendly and mutually beneficial relations between primary producers throughout the British Empire. The forthcoming tour has been arranged to take place during the winter months, when the climate of India is at its best, and will combine visits to important centres of agricultural and primary production, as well as to places of historic interest. The date of departure from London has been fixed for December 18, 1936, per S.S. *Corfu* (15,000 tons), leaving Southampton on the following day. The outward route will be via Tangier, Gibraltar, Marseilles (December 25), Malta, Suez Canal, Aden to Bombay (January 7, 1937). The tour will cross India by special train through Central and Northern India, as far as the Khyber Pass, returning via Calcutta and Darjeeling, visiting various points of interest en route; finally, southwards, via Madras, to Ceylon, where a week will be spent. The party will return from Colombo on March 3, by the S.S. *Christian Hygens* (16,000 tons), via Genoa and Villefranche (Nice) to Southampton (March 22). The cost of the entire tour, including transportation, servants in India,

MISCELLANEOUS NOTES

of £4 8s. 0d. per ton being lower by £3 6s. 6d. The index is reduced by 30 points to 109. On the other hand, both clover and meadow hay advanced in price, the combined index moving from 82 to 98. At 1s. 0½d. per lb. wool was dearer by ½d., and the index at 95 is higher by 1 point.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936		
	Aug.	Aug.	May	June	July

Wheat	64	103	84	84	86
Barley	123	103	105	92	84
Oats	92	92	82	82	83
Fat cattle	106	92	94	98	100
" sheep	128	104	130	131	128
Bacon pigs	103	98	113	119	113
Pork	108	97	108	112	106
Eggs	119	133	109	114	123
Poultry	116	115	121	124	117
Milk	168	175	162	162	175*
Butter	92	92	96	98	100
Cheese	96	85	103	108	113
Potatoes	153	137	174	160	139
Hay	101	101	82	83	82
Wool	87	89	96	94	94
Dairy cows	104	102	101	103	104
Store cattle	85	89	96	96	101
" sheep	104	111	107	119	113
" pigs	139	118	118	122	126

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	108*	114*	115*	115*	112*
Fat Cattle	107	107	107	111	114
General Index	122*	120	120	121	121*
	122	117	122	124	124

* Superseeding figures previously published.

Scholarships for the Sons and Daughters of Agricultural Workmen and Others

The selection of candidates for this year's awards under the Ministry's scheme of scholarships for the sons and daughters of agricultural workmen and others, has now been completed. The total number of applications received was 627, and 134 scholarships have been awarded. These awards were allocated as follows:—

Ten Senior Scholarships tenable at university departments

Grain. Wheat at an average of 7s. 8d. per cwt. was 9d. higher than in July, and the index moves upwards by 10 points to 96. (If "deficiency payments" under the Wheat Act be taken into consideration, the index is 122.) Barley and oats also appreciated in price, the former from 6s. 4d. to 7s. 7d., and the latter from 6s. 4d. to 6s. 10d. per cwt. The respective indices have risen by 16 points to 100 and 15 points to 98. In August last year wheat averaged 4s. 10d., barley 7s. 10d. and oats 6s. 5d. per cwt., the relative indices being 60, 103 and 92.

Livestock. At 34s. 5d. per live cwt. the average price for second quality fat cattle showed a decline of 1s. 3d. from that of July, but owing to the reduction being less pronounced than in the base years the index at 102 is 2 points higher; the effect of adding the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, is to raise the index to 117. Fat sheep, at an average of 9½d. per lb. for second quality, were unaltered both in price and index. Compared with July, quotations for bacon pigs appreciated from 11s. 3d. to 11s. 5d., and those for pork pigs from 11s. to 11s. 4d. per score (20 lb.). The index for the former at 111 is lower by 2 points on account of the rise in price having been slightly greater between the corresponding months of 1911-13; that for porkers rises from 106 to 107.

Dairy cows and store cattle were a little cheaper, but only in the case of dairy cows is the index lower, by 1 point to 103. Quotations for store sheep were higher and the index advances from 113 to 126. Store pigs also were dearer and show a rise of 7 points in their index to 133.

Dairy and Poultry Produce. The index of the regional contract price of milk is unchanged at 175. Butter at an average of 1s. 1d. per lb. was higher by 1d.; this increase, however, was counterbalanced by a similar rise in the base period, and the index remains at 100. Eggs at 14s. 4d. per 120 compared with 12s. 1d. in the previous month, and the index appreciates from 123 to 130. The rise of 2s. per cwt. in the price of cheese is not reflected in the index, which at 113 is the same as for July. Quotations for most descriptions of poultry declined, the combined index falling by 4 points to 113.

Other Commodities. Prices for first early potatoes, which are used in compiling the potato index for July and August, showed a considerable fall in the second month, the average

MISCELLANEOUS NOTES

Rothamsted Winter Lectures

SIR JOHN RUSSELL, Director of the Rothamsted Experimental Station, has again arranged that Mr. H. V. Garner, Guide-Demonstrator of this institution, and other members of the staff shall be available during the winter to deliver lectures on the experimental work of the station to members of chambers of agriculture and horticulture, farmers' clubs, farm workers' associations, agricultural societies and similar organizations. No fee will be charged for the lecturers' services, but participating societies will be expected to defray travelling and hotel expenses, and to make the necessary arrangements with the lecture-staff. Requests for lectures should give as long notice as possible. A syllabus of lectures and lecturers may be obtained on application to the Secretary, Rothamsted Experimental Station, Harpenden, Hertfordshire.

The Agricultural Index Number

THE August index number of prices of agricultural produce at 119 (base 1911-13=100) is 2 points above that of July, and 6 points higher than the figure ruling a year ago. If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index becomes 124. Wheat, barley, oats, fat pigs, eggs, butter and hay are the principal commodities showing an increase in price compared with July, while on the other hand values for fat cattle and potatoes showed a seasonal fall.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month.	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117*
August	121	105	105	119	113	119
September	120	104	107	119	121	—
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Superseding figure previously published.

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
Wheat ..	72	9.6	7 6
Oats ..	60	7.6	6 1
Barley ..	71	6.2	7 1
Potatoes ..	18	0.8	1 15
Swedes ..	7	0.7	0 14
Mangolds ..	7	0.4	0 14
Beans ..	66	19.7	7 3
Good meadow hay ..	37	4.6	3 15
Good oat straw ..	20	0.9	1 19
Good clover hay ..	38	7.0	3 19
Vetch and oat silage ..	13	1.6	1 6
Barley straw ..	23	0.7	2 5
Wheat straw ..	13	0.1	1 5
Bean straw ..	23	1.7	2 5

FARM VALUES.

The cost per unit starch equivalent works out at 1.91 shillings, and per unit protein equivalent 0.87 shilling. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the December, 1935, issue of the Ministry's JOURNAL, p. 955.)

Starch equivalent	Protein equivalent	Per ton
Barley (imported) ..	71	7 7
Maize ..	78	6 10
Decorated ground-nut cake ..	73	7 19
" cotton-seed cake ..	68	7 17
(Add 10s. per ton, in each instance, for cartage.)		
Starch equivalent	Protein equivalent	Per ton
71	6.2	7 7
78	7.6	6 10
73	4.1	7 19
68	3.4	7 17

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow:—

FARM VALUES OF FEEDING STUFFS

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Cocunut cake, 6% oil ..	£ s. 6 15	£ s. 0 17	£ s. 5 18	77	s. d. 1 6	d. 0.80	16.4
Ground nut cake, 6-7% oil ..	7 0*	0 17	6 3	57	2 2	1.16	27.3
Ground nut cake, decorated, 6-7% oil	8 2†	1 6	6 16	73	1 10	0.98	41.3
imported decorated, 6-7% oil ..	7 17	1 6	6 11	73	1 10	0.98	41.3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 11	6 4	73	1 8	0.89	16.9
Palm-kernel cake meal, 4½% oil ..	6 12†	0 11	6 1	73	1 8	0.89	16.9
Palm-kernel meal, 1-2% oil ..	6 0	0 11	5 9	71	1 6	0.80	16.5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale ..	5 5	0 10	4 15	48	2 0	1.07	12.5
" " dried porter ..	4 17	0 10	4 7	48	1 10	0.98	12.5

* At Bristol. † At Hull. ‡ At Liverpool.

† In these instances, manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of August, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then, since its manurial value is 19s. 0d. per ton as shown above, the cost of food value per ton is £9 1s. 0d. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations, a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—

N., 6s. 9d.; P₂O₅, 2s. 3d.; K₂O 3s. 4d.

PRICES OF FEEDING STUFFS

Description.	Price per ton	Mann- rial per value ton	Cost of food per value ton	Starch per 100 lb. equiv.	Price per unit starch equiv.	Price per lb. equiv.	Pro- tein equiv.
Wheat, British .. No. 3	7 5	8	6 17	72	1 11	1.03	9.6
Barley, Canadian, No. 3	7 10	8	7 2	71	2 0	1.07	6.2
Western ..	6 18*	8	6 10	71	1 10	0.98	6.2
Persian ..	7 12	8	7 4	71	2 0	1.07	6.2
Russian ..	6 17	9	6 8	60	2 2	1.16	7.6
Oats, English, white ..	6 17	9	6 8	60	2 2	1.16	7.6
black and ..	6 17	9	6 8	60	2 2	1.16	7.6
grey ..	6 17	9	6 8	60	2 2	1.16	7.6
Scotch, white ..	8 7	9	7 18	60	2 8	1.43	7.6
Canadian, No. 2 ..	8 15*	9	8 6	60	2 9	1.47	7.6
Western ..	6 12	9	6 3	60	2 1	1.12	7.6
Maize, Argentine ..	6 10	7	6 3	78	1 7	0.85	7.6
DanubianGal.Fox.	6 10†	7	6 3	78	1 7	0.85	7.6
South African,	7 0	7	6 13	78	1 8	0.89	7.6
No. 2 White Flat	7 0	7	6 13	78	1 8	0.89	7.6
Pears, Japanese ..	20 15†	0 14	20 1	69	5 10	3.12	18.1
Milling Offals: —	6 2	0 15	5 7	43	2 6	1.34	9.9
Bran, British ..	6 12	0 15	5 17	43	2 9	1.47	10
bread ..	6 17	0 12	6 5	69	1 10	0.98	12.1
Middlings, fine, ..	7 0	0 13	6 7	56	2 3	1.20	10.7
imported ..	7 12	0 12	7 0	69	2 0	1.07	12.1
Weightings† ..	6 5	0 13	5 12	50	2 3	1.20	11
Superfine† ..	8 12	0 8	8 4	71	2 4	1.25	6.2
Meal, barley ..	7 17	0 8	7 9	71	2 1	1.12	6.2
grade II ..	7 2	0 10	6 12	84	1 7	0.85	10.3
maize ..	7 0	0 7	6 13	78	1 8	0.89	7.6
germ ..	7 15	0 5	7 10	71	2 1	1.12	3.6
locust bean ..	8 5	0 16	7 9	66	2 3	1.20	19.7
bean ..	14 10	2 0	12 10	59	4 3	2.28	53
fish (white) ..	7 5	0 7	6 18	84	1 8	0.89	9.2
Maize, cooked, flaked ..	6 15	0 12	6 3	76	1 7	0.85	19.2
gluten feed ..	9 10	0 19	8 11	74	2 4	1.25	24.6
English, 12% oil ..	9 0	0 19	8 1	74	2 2	1.16	24.6
9% ..	8 15	0 19	7 16	74	2 1	1.12	24.6
6% ..	9 28	0 19	8 3	74	2 2	1.16	24.6
Cottonseed cake, ..	5 12	0 17	4 15	42	2 3	1.20	17.3
English, Egyptian ..	5 10	0 17	4 13	42	2 3	1.20	17.3
Cottonseed cake, 4½% oil ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
decolorated meal, ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
Cottonseed meal, ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
decolorated, 7% oil ..	7 17†	1 7	6 10	68	1 11	1.03	34.7
decolorated, 7% oil ..	7 17†	1 7	6 10	68	1 11	1.03	34.7

indigestible. This view has been based upon the results of a single digestion trial by Kellner nearly forty years ago, but must be considerably modified in the light of more recent tests. In Kellner's trial, only one-third of the organic matter of the cacao shell was apparently digested, and less than one-twentieth of its protein. In the more recent tests, digestion coefficients ranging from 40 to 55 per cent. were found for the crude protein, and 51 to 85 per cent. for the true protein. On the basis of his own data Kellner assessed the production of starch equivalent of cacao shell at 34 per cent.; the new data raise this to 42 per cent., which places cacao shell meal—vitamin value and other specific properties apart—on a level with wheat bran.

Its one outstanding advantage is its richness in Vitamin D, which apparently arises not from the shell itself, but from the yeasts and other organisms that grow upon it during the processes of sun-drying and fermentation that are an essential part of the preparation of the cacao beans for commercial use. In the Reading test quoted above, the level of Vitamin D in butter produced under winter feeding conditions was raised by the use of cacao shell meal to that of summer butter. The point is one of practical importance in view of the growing interest in the qualitative aspects of the human dietary.

the rate and extent of secretion of the digestive juices and of the assimilation of the products of digestion.

In rationing practice the percentage of dry matter in the ration is usually taken as a criterion of its bulkiness, but clearly this can at best be only a very crude and uncertain guide. The same difficulty must also beset any attempts to lay down minimum or maximum fibre standards for rations. The dietetic qualities of rations which determine their "suitability" are too complex to be measurable in terms of any simple standard, and in the present state of knowledge of the subject, one can do little more than apply "hit or miss" methods of adjustment to rations that, though quantitatively in conformity with "feeding standards," are found on trial to possess qualitative defects. In making such adjustments the stockman's eye on the physical character of the droppings still remains the best, if not indeed the only, available criterion.

Cacao Shell Meal. The discovery two years ago, that this by-product of the cocoa industry is relatively rich in Vitamin D, has revived interest in its possibilities as a feeding-stuff for farm livestock. Average samples contain about 15 per cent. of crude protein, 6 per cent. of oil, 46 per cent. of "soluble carbohydrates," 15 per cent. of fibre and 7 per cent. of mineral matters, figures not unlike those of wheat bran. It is fairly readily eaten by livestock, and if used in moderate quantities, along with other foods, is apparently quite wholesome. It contains a small proportion of the alkaloid theobromine and, therefore, its use in large quantities may be attended with a measure of risk, especially with the non-ruminant animals, and a few instances of illness following its use are recorded in the older literature. In one case, reported in 1921, horses that received 700 gms. (1.54 lb.) of cacao shell, containing 0.7 per cent. of theobromine, became seriously ill and several died. On the other hand, in recent tests at Reading, dairy cows consumed 2 lb. per head daily for several weeks without any ill effects. German experience indicates that it may safely be fed to cows and fattening cattle even up to 5 lb. per 1,000 lb. live-weight daily, especially along with molasses, and that it can also be used in moderate amounts in pig-feeding.

In addition to this possible risk, the cacao shell has hitherto suffered the further disadvantage of being regarded as very

In mechanical factors, such as that of bulk, lie undoubtedly the explanations of many of the apparent discrepancies between practical experience and the results of feeding experiments. A case in point is the extraordinary diversity of opinion and experience as to the nutritive value of bran. The improvement of feeding results obtained when bran is added to certain rations, despite a lowering thereby of the available nutritive energy of the ration, is undoubtedly due partly, and probably largely, to the change effected in the mechanical characteristics of the ration whereby it becomes better suited to the animal. Where the ration is already suitable in bulk, an addition of bran is more likely to impart than to improve the results. This is well illustrated by one of Sheehy's experiments at Glasnevin, in which the effects of inclusion of bran in a concentrated pig ration were found to vary according to the proportion of bran used, the inclusion of 10-20 per cent. being beneficial, whilst 30 per cent. was detrimental.

The mechanical character of a dietary may be affected by a variety of factors, many of which contribute to the characteristic of bulkiness. Thus hay and similar fodders are bulky, partly because of their large content of fibrous material and partly because of their characteristic open texture. Among the concentrated foods also, differences of bulk are largely, but not entirely, correlated with fibre content. The relative bulkiness of foods may vary also according to whether they are compared in the dry or wet condition. Ground oats and bran, for example, are similar in bulkiness in the dry state, but in the wet state bran is decidedly the more bulky. Other methods of preparation of food, such as flaking, may also have considerable effects upon the physical properties.

In roots and similar succulent foods, bulkiness is determined by their high content of water, and the consequent turgidity of the cellular structure, rather than by fibre-content; the dry matter of roots tanks, in fact, as a relatively non-fibrous material.

In some instances the beneficial effect of the feeding-stuff may not be associated with bulk at all, but with the specific effect of some particular ingredient, such as the familiar laxative influence of the mucilage of linseed, or the purely lubricative effect of liquid paraffin. Other possible specific effects, about which little is known as yet, are associated with

NOTES ON FEEDING

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Mechanical Factors in Nutrition. The ideal ration is one that not only contains all the essential nutrients and accessory ingredients in optimum proportions, but also is palatable and suited in mechanical character and dietetic qualities to the class of animal for which it is intended. Guidance as to the desirable proportions of the different essential ingredients is obtained mainly by way of experiment, the results of which can eventually be co-ordinated into "feeding standards," but the problem of "suitability" is less amenable to experimental investigation, and in large measure must be left to intelligent observation and skilful "stockmanship" in the practical use of rations of diverse types.

It is a common experience in nutritional advisory work that rations that appear to be quite suitable in make-up fail to come up to expectation in practical application, and in such cases it is obvious that the fault must lie in defects of palatability, mechanical character, or other factors not taken sufficiently into account in drafting the ration.

Defects of palatability are easily detected and usually not difficult to overcome, but defects in mechanical character may be more easily overlooked, and may, indeed, vary considerably as between individual animals. Of these defects, that which is most obvious, and has, therefore, received most attention, is an unsuitable volume or bulkiness of the ration.

In text-books on nutrition it has always been laid down that the volume of the ration must be adapted to the capacity of the digestive organs. If the food is too compact the animal will never feel satisfied, and consequently will not do its best; it will try to make up the deficient bulk by consuming litter or anything else within reach. If, on the other hand, the ration is too bulky the animal will not be able to consume sufficient to ensure the production required from it.

In the rapid development of the scientific control of farm feeding during the present century, there was for a time a tendency to overlook this important practical point, and credit must be given to Bouthour for restoring it to its proper place in the construction of rations.

PRICES OF ARTIFICIAL MANURES

Average prices per ton (2,240 lb.) during week ended Sept. 9.						Description.	
Bristol		Hull		L'pool		London	
£ s.	9 10	7 12d	7 12d	7 12d	7 12d	7 12d	7 12d
9 6	9 6	7 12d	7 12d	7 12d	7 12d	7 12d	7 12d
10 9	7 5d	7 5d	7 5d	7 5d	7 5d	7 5d	7 5d
9 4	6 7	6 16d	6 16d	6 16d	6 16d	6 16d	6 16d
6 7	6 7	6 16d	6 16d	6 16d	6 16d	6 16d	6 16d
Unit†							

phosphatic fertilizer is not applied elsewhere in the rotation, it is important that at seeding time the bean crop should receive 4 to 5 cwt. per acre of superphosphate, or its equivalent in the form of basic slag, in addition to any farmyard manure that may be available.

It has been generally recognized for some time that soluble phosphatic fertilizers play a specially important part in the growth of leguminous crops. The phosphate apparently has a beneficial effect on the development of the root nodules, on which the plant is dependent for its powers of utilizing atmospheric nitrogen. In addition to its effect on the actual yield of beans, however, soluble phosphatic fertilizer also appears to influence their chemical composition, not merely as regards content of phosphorus, but also nitrogen content. During a recent examination of produce from the Saxmundham experiments, chemical analysis showed that mature beans from plots receiving regular dressings of superphosphate contained an average of 4.46 per cent. nitrogen in their dry matter as compared with only 4.10 per cent. nitrogen in beans from plots that had received no phosphatic fertilizer for a number of years. This difference of 0.36 per cent. nitrogen is of interest to the stockfeeder who relies on beans as a source of protein, for, if the nitrogen is present as true protein, this difference is equivalent to approximately 2½ per cent. protein and, though it was probably accentuated by the accumulated phosphate deficiency in this particular series of plots, this effect on composition cannot be ignored altogether.

There is little reliable evidence on which to compare the merits of superphosphate and basic slag for beans, and, provided a high-soluble slag is used, there is probably little to choose between the two. On the evidence of the Saxmundham experiments, however, superphosphate is definitely superior to bone meal for the bean crop. Plots receiving superphosphate gave a heavier yield of beans, with higher nitrogen content, than plots receiving bone meal.

recommendations made by the authors of the Cambridge report, who suggest that half the nitrogenous dressing should be applied at seeding time and half reserved for May application. This recommendation, whilst applicable to land not in a high state of fertility, should obviously be interpreted with caution on land in good "heart," where autumn application of nitrogen may result in a "winter proud" crop. On such land it may be best to omit the autumn dressing and apply the spring dressing later than has been the practice in the past. There are no grounds for apprehension as to the effect of a late application of nitrogen on the standing powers of the crop. Plots receiving nitrogen in May have shown no greater tendency to lodge than plots receiving nitrogen in February.

Field Beans. Very few experiments have been carried out on the manuring of field beans, though the crop is one that responds well to proper manurial treatment, and, though the relatively low price of other high-protein food-stuffs tends to limit the demand for beans for feeding purposes, the crop has still a very definite place in the agriculture of some districts, especially those on the heavier types of soil. Such experimental evidence as is available is quite conclusive on two points: (1) the highly beneficial effect of an application of farmyard manure, and (2) the importance of an adequate supply of phosphate. The value of potash is less certain: if farmyard manure is used, additional potassic fertilizer seems to be unnecessary, but, if no farmyard manure is available, the evidence is in favour of giving the equivalent of 1 to 1½ cwt. per acre of muriate of potash, the smaller dressing on heavy soils and the larger dressing on lighter soils.

Results of the rotation experiments at Saxmundham (East Suffolk) for a ten-year period, published some time ago, clearly indicated that beans benefit from farmyard manure applied anywhere in the crop rotation, but the heaviest yield was obtained when the application was made *direct* to the bean crop. As regards phosphatic fertilizer, however, 5 cwt. per acre of superphosphate gave an increase in yield of 6 to 8 bus. of beans per acre, irrespective of whether the application was made direct to the beans or to one of the preceding crops in the rotation. In other words, if a good dressing of

quantity. The results of a further experiment, carried out on the 1936 crop, have not yet been published, but the writer is informed that, this season, nitrogen applied in May has given the best results. Bearing in mind the wet winter of 1935-36, it will be seen that this confirms the previous results. The other report² referred to above describes a somewhat different type of experiment carried out at Rothamsted. Loss of nitrogen by leaching and any danger of drought limiting response to nitrogen were overcome by the use of pot cultures. The wheat was grown in pots in which the soil was kept adequately moist, but never wet enough to cause drainage from the pots, the results, therefore, relate to the effect of nitrogen under controlled moisture conditions. The manure used was nitrate of soda, and seven different times of application were compared, ranging from November to June. The nitrate of soda gave an almost constant increase in the yield of *grain*, whether the fertilizer was applied in November, January, March or May, but the method by which the increase was produced varied with the time of application. Early applications gave a large increase in the number of ears and a small decrease in the size of grain and number of grains per ear, whereas late applications gave only a small increase in the number of ears, but also showed increases in the size of the grains and the number of grains per ear. Nitrate of soda applied after May gave no increase in yield of grain. Early application gave an increase in the yield of *straw*, but applications in late April, May or June had no effect on straw yield.

This experiment confirms the view that seasonal variations in the effects of nitrogen applied at different stages in the growth of the crop, as found in the field experiments, are largely due to variations in moisture supply, and, in general supports the findings of the field trials regarding the efficiency of a May application, *given adequate rainfall in June*. Chemical analysis of the grain from the pot cultures showed that late application led to a higher nitrogen content in the grain, indicating improved quality. The plants took up the same amount of nitrogen irrespective of whether it was applied early or late, but apparently more nitrogen found its way into the grain following the later applications.

Further field trials under a wider range of soil and climatic conditions are obviously desirable, but, in the meantime, the general position may be summarized in the terms of the

Time to Apply the Nitrogenous Fertilizer. In this connection a good deal of experimental work has been carried out in recent years, and the results confirm the importance of bearing in mind the question of weather conditions. Should part of the dressing be applied in the autumn, or should the whole application be reserved until the spring? In what month should a spring application be made? Is it best to replace at the earliest opportunity, any nitrogen leached out during a wet winter, e.g., by a February dressing, or should the application be delayed until such time as it will tend to increase ear size rather than encourage the formation of more tillers?

The report of the latest series of experiments carried out on this subject at Cambridge, and covering the period 1929-35, provides direct evidence as to the effect of weather conditions on response to nitrogenous fertilizer applied at different stages in the growth of wheat. Three times of application were compared, viz., autumn, February, and May, the fertilizer being sulphate of ammonia. The best results were not obtained in all seasons from the same time of application. On a wet winter, autumn dressings were ineffective, while May dressings were beneficial provided there was sufficient rainfall in June to wash them into the soil. On the other hand, when the winter was dry, the autumn dressings gave the best return. February dressings never gave the highest yield. Throughout these experiments, time of application appeared to be more important than

NOTES ON MANURING

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Winter Wheat. Estimates of the probable yield of the 1936 wheat crop suggest that in many districts it will be lower than the average, many farmers blaming the wet winter of 1935-36 and lack of sunshine during the growing season for this reduction. The influence of meteorological conditions on the yield of wheat cannot be denied, but it may be worth while considering the matter from the standpoint of the manuring of the crop, especially in the light of experimental results recently published.^{1, 2} There is ample evidence to suggest an important relationship between weather conditions, particularly rainfall, and the effect of manures on the wheat crop.

The chief fertilizers likely to be needed by wheat are those that supply phosphate and nitrogen; only on the lighter types of soil is there likely to be any appreciable response to potassic fertilizers. Wheat following potatoes or beans, or grown after "seeds" or bare fallow (especially if farmyard manure is applied), should not require anything more than a top dressing of a nitrogenous fertilizer—provided the preceding crops in the rotation received adequate dressings of phosphate fertilizers. Where wheat is grown after a cereal crop, the soil is likely to contain much smaller quantities of available plant food, and it is usually desirable to supply both phosphate and nitrogen. The phosphate may take the form of 2 to 3 cwt. per acre of superphosphate. This should always be applied in the *autumn*, as it will then help in the establishment of a strong, well-rooted plant. There is little fear of any serious loss of phosphate through washing out by winter rains, as may happen with nitrogenous fertilizers.

Quantity of Nitrogenous Fertilizer. This will obviously vary with the actual "condition" or "heart" of the soil, but wheat responds well to nitrogen, and, when taken as a second cereal crop, up to 1½ cwt. per acre of one or other of the common nitrogenous fertilizers such as sulphate of ammonia,

Sheep. In most mountain flocks, the ewe lambs are sent off for wintering early this month. The general aspects of this system were discussed in these notes for April. In one part of Britain, where the amount of sheep scab is relatively high, a second double-dipping is enforced in order to ensure that sheep that are sent to other counties for wintering do not spread it. With the draft ewes and wethers sold, and the ewe lambs away for their winter pastures, there remains only the bringing down of the flock to the lower grazings, and the tupping, which may be any time from the last week in October to early December.

With folded sheep, there may be trouble at this time of year through scouring, caused by a change from grass or forage crops to roots. The change should be made gradually. The manager of a farm, with a large flock of half-breds in South Wiltshire, stated recently that his experience had shown him the great value of bringing in the younger sheep to the fold early in August. In this way, they got used to folding before severe weather sets in; a previously high death-rate amongst the young ewes was, in this way, reduced to negligible proportions.

attack on one or two beasts soon spreading through the herd. Young animals, such as calves and yearlings, and stock in poor condition, are more subject to attack than older or thriving cattle. Some attacks are readily transmitted to human beings, and may be by no means easy to cure in the latter. What appears to be a variation in the nature of ring-worm attack is explained by the fact that it may be caused by a variety of fungi. This is explained in the Ministry's Advisory Leaflet No. 132,* in which the treatment is also described. Treatment is simple and effective but, as in the case of warble-fly treatment, it is the catching of the animals that is often responsible for delaying the work.

A bunch of heifers may have one or two animals with warts on the teats. If there are numerous warts, and if the heifers have not been bulled, it is better to put such animals aside for fattening. Those kept because of their breeding value may be treated by tying the warts tightly with string, when they eventually drop off.

Many bull sales are held this month, and breeders of dairy cattle can end up the month by a visit to the Dairy Show. There are few shows where a combination of performance and appearance in the exhibits is required to such an extent as at the Dairy Show. The competitions within the breeds and the inter-breed competitions focus attention on the best animals of these breeds. An interesting bull sale is held each year at the Hertfordshire Institute of Agriculture, St. Albans, when Dairy Shorthorn and Lincoln Red bulls by proved sires are put up to auction on the same day as the recorded pigs. In the last sale, for instance (October, 1935), all the young bulls (purchased as calves) were bred from long-lived sires that had proved their prepotency in the transmission of high milking capacity to their progeny. Thus, one of the progeny-tested sires, Ketteringham Milkman, the sire of four of the young bulls offered, had the following record:—

Average mature yield of 43 dams was 846 gal.

Average mature yield of 43 daughters of these dams was

963 gal.

Thus the daughters sired by the bull had an average of over 100 gal. more milk per lactation than their dams. This sale is not only of interest to the practical breeder, but also to those who have followed the research work and discussions of recent years on progeny-tested sires.

almost perfect plant. The writers recalled a similar experience 30 years ago by Mr. J. W. Moss, who gave his results in a paper at Chelmsford. Such experiences of the value of a good start give strong support to the case for autumn dressings when wheat follows grass and when wire-

It is a wise precaution to dress wheat seed with a preparation against bunt (covered smut). The prevalence of loose smut this summer has caused many seed growers to reach an erroneous conclusion about the efficacy of seed treatment. Loose smut cannot be prevented by chemical treatment, but bunt or covered smut is preventable. The well-known mercurial preparations, or dry copper carbonate, are easily used and very effective.

The bean crop is important on heavy land, and is considered by many to merit greater attention; it is a crop that makes an excellent preparation for wheat. The area grown for stockfeeding this year was just over 121,000 acres, less than a tenth of the area under oats. Winter beans should be sown early. The crop is very subject to attack by rooks and pigeons, and, since it is deeply sown and slow growing, remains a long time in the stage when it is appealing to birds, unless it is sown early before the soil gets cold. Lord Eilsley, writing recently on the bean crop in *The Farmer and Stock-Breeder*, noted that, where farmyard manure is not available, a dressing of superphosphate, well distributed on the land just before drilling, generally provides the stimulus required to grow a good crop on heavy land. It may be mentioned that the winter varieties are not suitable for areas where long, hard frosts are experienced. The capacity of the crop for recovery from frost is, however, greater than is often realized. A crop blackened by frost or an east wind, and appearing beyond hope to those with no experience of growing it, may throw off all traces of damage after a fortnight.

Cattle. Many of the younger cattle are brought indoors at the end of this month unless the weather remains mild. An opportunity is afforded for giving individual attention to the animals should it be necessary. The cattle may, for instance, require treatment for ringworm, an affliction that may cause great inconvenience on farms where there are many cattle. Some attacks are more difficult to eradicate than others, an

the looser type were seen, but a considerable proportion of the Continental crop is lifted by hand with ordinary short-handled spuds. Topping is mostly done by hand, either with a chopper as the beets remain in rows on the ground, or with a hook, the worker standing upright and picking up the beet one by one with the point. Topping standards vary greatly on the Continent, being very light in some areas, as in South Sweden, and heavy in others, as in parts of Germany, where there is a tendency to regard stock feeding as of equal importance to sugar production.

The cleaning of the beet was found to be mostly carried out by knocking the roots together, as in this country. Cleaning on the ground by harrowing was mentioned in several districts, but was not actually seen in progress. Incidentally, an interesting experiment in beet cleaning was carried out on a large scale in England last season, when beets were unloaded at the foot of an elevator, as the roots were carried up the elevator to the waggon for delivery to the factory, they were thoroughly washed by a powerful spray of water. To revert to Continental methods, the use of light railways was found to be a notable feature in most European countries, where the grouping round the factories was closer, and temporary field lines could be connected with permanent systems of similar gauge running right into the factory.

Cereals and Beans. Early October is the best time for sowing wheat; much of the wheat will have been sown where it follows bare fallow. The past summer has been unfavourable for a successful bare fallow, and sowing on such land is later than usual. The wet summer, in addition to its effect on weeds, will also have caused a greater loss than usual of soluble plant-food from the soil, and an autumn fertilizer dressing will give the crop a good opportunity of establishing itself before winter. An autumn dressing can also be recommended where the crop follows grass, if wireworm attack is feared. J. A. McMillan and F. Hanley (this JOURNAL, March, 1936), in an investigation on the effect of sowing fertilizers in contact with the seed of barley and sugar-beet, observed that when fertilizer was broadcast, the barley seedlings were enabled to grow away better from wireworm attack than on the plots getting none, while on plots where the manure was drilled in contact with the seed there was an

earlies is lifted before the crop reaches maturity and the crop may be more easily damaged by mechanical lifters.

Many experienced growers consider, however, that ploughs and spinners are often blamed for damage that is really caused during the filling and emptying of the carts, but that is not observed until the clamps are opened. The modern spinner, properly handled, is a very efficient machine as can be judged by the large number in use.

Various materials are used for covering potatoes before the soil is put on the clamp. Straw is the most common, and bracken is much used in some districts. Seaweed is also suitable, and has the advantage that it checks sprouting. There is no need for soil if a good layer of seaweed is used. A party of farmers from North Wales, on a visit to the Dublin district at the end of May some years ago, were very surprised to observe that, when a potato clamp that had been covered with seaweed was opened, the tubers were entirely devoid of sprouts.

Sugar-Beet. A great demand on the labour resources of the farm is now made by the beet harvest. Lifting, knocking off the soil, topping and loading are still mostly carried out by hand. There are many horse-drawn beet lifters in use, and lifters of the one- or two-rowed type for use with tractors can also be seen. It is often asked whether the methods of cultivating and harvesting of this crop in Britain are not inefficient compared with those on the Continent, where beet has been cultivated much longer than in this country. A tour of the main beet-growing areas of Europe was recently carried out by two British experts, in order to examine the methods of cultivating and harvesting of sugar-beet, and to take particular note of mechanical appliances used. The observations and conclusions are contained in the Ministry's Bulletin No. 102 (*Sugar-beet on the Continent*), by F. Rayns and S. J. Wright.* The authors consider that, as a whole, beet-growing soils on the Continent are definitely easier to work, more suited to the crop and less varied in character than the beet soils of this country. As regards harvesting, the organization in the field was not considered to differ essentially from our own practice. Many kinds of lifters of

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s., post free 1s. 2d.

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NOTES FOR THE MONTH

British Commonwealth Scientific Conference

THE British Commonwealth Scientific Conference, to which reference was made in the last (October) issue of this JOURNAL, resumed its sessions in London on October 2. The Conference has been principally engaged in reviewing the activities of the various agricultural bureaux or information centres, and certain research work, coming within the scope of the Executive Council of the Imperial Agricultural Bureaux and financed on an inter-Imperial basis. The report, which will be submitted for the consideration of the Governments of the British Commonwealth before publication, covers a wide field and includes recommendations for increasing the effectiveness of the scientific information service provided by the bureaux. The Imperial Institutes of Entomology and Mycology have also been the subject of review, and the establishment of two additional bureaux within the Empire, in dairying and forestry, respectively, has received consideration.

At the dinner given by His Majesty's Government in the United Kingdom on October 7, the Right Hon. W. Ormsby Gore, M.P., (Secretary of State for the Colonies) extended a cordial welcome to the delegates. In 1927 it was his privilege to preside over a Committee that was considering the co-ordination of scientific research carried on in this country by the Government. They had discussed the dissemination of the results of research and the avoidance of unnecessarily duplicated effort. One of the chief difficulties of research workers was concerned with the immense number of scientific journals that came before them. Results must be made readily available to scientific workers. In 1927 delegates of the Empire Governments met in this country at the Imperial Agricultural Conference to consider, among other things, the problems that had been discussed at the present Conference, and from their discussions arose the Imperial Agricultural Bureaux. The speaker recalled the origin of the Conference in a resolution of the Imperial Economic Conference that met in Ottawa in 1932, and more immediately in

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a recommendation of the Imperial Committee on Economic Consultation and Co-operation that met in London in 1933. This Committee, considering the method by which Empire co-operation in scientific investigation could be effected, suggested that a conference representative of Empire countries should be summoned to formulate a programme of such forms of research as might be conducted on an inter-Imperial basis.

Replying on behalf of the delegates, Major-General A. G. L. McNaughton, C.B., C.M.G., D.S.O., M.C., representing Canada, said the atmosphere of friendly co-operation provided by their hosts had made it easy for them to deal with the problems under consideration. Their task had been to see that the organizations and institutions under review were directed to the practical application of the information that they received. Not the least of the advantages of such conferences was the proof they afforded that it was possible for representatives of countries widely distributed and divergent in conditions and problems, to meet together to resolve their mutual difficulties. The speaker paid a tribute to the sympathetic chairmanship of Sir Charles Howell Thomas, and to the valuable services of the Secretary of the Executive Council of the Imperial Agricultural Bureaux, Sir David Chadwick, C.S.I., C.I.E.

The final session was held on October 8, when the Chairman read the following telegram from His Majesty's Private Secretary, acknowledging the message that had been sent by the Conference: "I am commanded by the King to convey to the members of the British Commonwealth Scientific Conference, His Majesty's sincere thanks for the loyal sentiments and good wishes to which they have given expression at the conclusion of their deliberations."

In his closing speech the Chairman said that the success that had attended the Conference showed that the foundations of inter-Imperial co-operation, as represented by the system of Imperial Agricultural Bureaux, had been well and truly laid. The Conference had affirmed its belief in the value of co-operation in the field of scientific endeavour, and had performed a real service by demonstrating the extent to which difficult and complicated problems might be resolved by frank interchange of views round the table, in an atmosphere of harmony and goodwill, between those who are masters of their subjects.

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Cambridge University Farm : New Buildings

A SCHEME for the rehabilitation of the buildings of the University Farm, Cambridge, and for the erection of new buildings, has been under consideration for some time. It was first proposed as a part of a scheme for the extension of the School of Agriculture and of several of the Science Departments of the University, which was promoted and liberally supported by the International Education Board (Rockefeller Foundation), and was also assisted by grants of £50,000 each from the Treasury and the Empire Marketing Board. Sanction has now been given for a grant of £4,463 for the erection of new experimental piggeries and of an implement shed on the farm, together with the creation of a maintenance fund.

It is anticipated that the rebuilding scheme on the farm will cost, in all, some £12,000.

Diseases of Bees

A CONFERENCE on " Diseases of Bees," under the chairmanship of Sir John Russell, was held at Rothamsted Experimental Station on September 26, 1936.

A paper entitled, " Brood Diseases in England : the Results of a Three Year Investigation," was read by Dr. H. L. A. Tarr. He stated that a number of different brood diseases of the bee existed in England; American foul brood, Addled brood and European foul brood being the most prevalent. He discussed experiments in which it was shown that American foul brood is a distinct disease caused by *Bacillus larvæ*, and that a relatively large inoculum of the spores of this organism obtained from pure cultures is required to produce the disease in healthy colonies of bees. The vegetative cells of this organism produced no disease when introduced in large numbers into healthy colonies. Addled brood was found to be very prevalent, accounting for about 28 per cent. of all specimens of diseased brood received at Rothamsted over a three-year period. He showed that this disease is rather a unique one, being caused by a defective queen. Requeening cured the disease in all cases studied, but the need for further research was emphasized. European foul brood, he said, was a distinct disease, which was probably caused by a small, lanceolate-shaped, non-spore forming organism. The fact that this bacterium would not grow on any of a large variety of specially-prepared media

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under different conditions, made it impossible to state with absolute certainty that it caused the disease. The disease was modified by spraying cultures of the bacteria, occurring as secondary invaders, over the developing brood of recently-infected colonies.

Dr. Guy Morison of Marischal College, Aberdeen, described his experiments on Bee Paralysis. He first defined the disease, describing its symptoms, and compared it with certain other diseases of adult bees. It is significant that he found that bees affected with this disease invariably have small spherical or ellipsoidal bodies inside the cells of the anterior end of the small intestine. These bodies, he believed, might be "inclusion bodies" of the type found in virus diseases of plants and animals: they never occurred in any healthy bees that were examined. The technique employed in demonstrating these bodies was briefly described, and the necessity for further investigation emphasized. Additional information with reference to this disease appeared in the discussion: the possible infectious nature of the disease, whether more than one disease exists under this heading, and the methods of treatment which have been employed in practice were mentioned.

The results obtained by Swiss investigators on brood and adult bee diseases over an extensive period were described in an interesting paper by Dr. Otto Morgenthaler of Berne. With the aid of charts he described the way in which American foul brood had been successfully dealt with in Switzerland. He showed that, in contrast to American foul brood, European foul brood had greatly increased in Switzerland during the past few years, and he emphasized the need for more effective measures to prevent its spread. While American foul brood can be found in Switzerland at almost any time during the brood-rearing season, European foul brood shows a remarkable seasonal occurrence, being extremely prevalent in the spring, frequently disappearing in the autumn, only to return the following spring. The Swiss beekeepers, he said, no longer fear Acarine disease because the Frow treatment has proved uniformly successful in eradicating this disease from infected stocks. On the other hand a remedy for Nosema remains to be discovered, though in Switzerland this disease is not feared as much as previously.

A paper specially prepared for the Conference by Dr. J. I. Hambleton of the United States Department of Agriculture

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was read. This paper described the ravages which American foul brood has made, and is still making, among bee colonies in the United States. In this country the "shaking treatment," which was formerly considered a satisfactory control measure, has been abandoned,* and burning both bees and combs has been resorted to in the hope that the disease may be overcome. At one time it was hoped that formaldehyde-water, formaldehyde-alcohol or gaseous chlorine would prove a satisfactory method of sterilizing combs from stocks affected with American foul brood, but experience has proved that such substances are useless. Recent experiments, carried out in the United States as part of the campaign against American foul brood, have been directed toward breeding a race of bees immune to this disease.

In the discussion Mr. L. Illingworth referred to the formation of "Bee Diseases Insurance Ltd.," a Society registered through the National Farmers' Union," which it is hoped will provide a means of overcoming brood, and eventually adult, diseases of bees in England. Mr. Herrod-Hempsall stated that, in his opinion, brood diseases offered a serious menace to successful beekeeping in England. Dr. Gregg moved a resolution that the beekeepers should continue their financial support of the brood diseases investigation at Rothamsted: this resolution was carried unanimously.

A detailed report of this Conference is being published, and copies will be obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

The Purchase of Poisonous Insecticides, Fungicides, Weedkillers and Dips for Animals, by Professional Farmers and Horticulturists

UNDER the Pharmacy and Poisons Act of 1933 and the Poisons Rules, 1935, professional farmers or horticulturists—that is to say, those engaged in agriculture or horticulture as a trade or business—are in a special position in respect of the purchase of poisonous insecticides, fungicides, dips and weedkillers. The following note, which is not, however, intended as a comprehensive statement of the requirements of the Act and Rules, indicates the procedure to be adopted

* It seems probable that the failure attributed to this procedure is really due to insufficient care being taken by beekeepers, and not, especially in view of Dr. Morgenthaler's results, due to any inherent weakness in the method.

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by the professional farmer or horticulturist in the purchase of some of the more generally used poisons.

(1) In the first place, it may be pointed out that there are three categories of seller with whom the professional may deal:—

A.—*Authorized Sellers of Poisons*—a category confined solely to those who keep chemists' shops.

B.—*Listed Sellers of Part II Poisons*—who comprise horticultural sundriesmen, ironmongers, and other shopkeepers who are registered by the Local Authority for the retail sale of certain of the more commonly used poisons.

C.—*Wholesale or Manufacturing Firms* who are not shopkeepers.

(2) The professional may obtain from any of these sellers the following poisons:—

Arsenical dips and sheep washes.

Calcium and copper arsenates and arsenites as insecticides and fungicides.

Lead arsenate

Nicotine

Mercuric chloride

Mercuric iodide, organic compounds of mercury

Paris green (copper acetoarsenite)

} as insecticides,
fungicides or
seed dressings.

The professional, in purchasing any of these chemicals, must either himself be known to the seller as a person to whom poisons may properly be sold, or produce a certificate to the same effect from some householder known to the seller to be a responsible person of good character. When making a purchase at a shop, the purchaser must sign the Poisons Book, or, if he is ordering by post, provide the seller with an order in writing signed by himself, stating his address, trade or business, the quantity of the article, and the purpose for which it is needed. If he urgently requires the poison and is prevented by some emergency from attending to sign the Poisons Book or send a signed order, he may obtain delivery by ordering the poison by telegram or telephone, provided that within 24 hours he either signs the Poisons Book or provides the order in writing indicated above (penalty for failure to do so—£50).

(3) The professional cannot obtain sodium or calcium cyanide from a listed seller of Part II poisons, but may do so from an authorized seller of poisons (i.e., a chemist's shop) or from a wholesale or manufacturing firm. Again, he must sign the Poisons Book or send a written order as in (2).

(4) Other agricultural and horticultural "poisons"—e.g., formaldehyde or sulphuric acid, can be obtained from any of the sellers indicated in para. (1) without formality.

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(5) Strychnine may no longer be lawfully supplied for any purpose except in the form of a medicine—e.g., it may not be sold for the destruction of vermin.

(6) The Act requires certain precautions in respect of the labelling of poisons and the containers in which they are kept. Where the farmer or horticulturist buys a bulk supply of any poison and then issues it to his employees in other containers, he must see that each container is correctly labelled and that it is sufficiently strong to prevent leakage under ordinary risks. Where a bottle holding 6 pints or under is used, it must be a "poison bottle"—i.e., fluted vertically with ribs or grooves so as to be recognized by touch. Such procedure as the keeping or issue to employees of nicotine in beer bottles, or lead-arsenate powder in paper bags, is illegal, and by so doing the farmer will render himself liable to heavy penalties.

(7) It is unlawful for any person knowingly to transport certain poisons, among them being arsenical poisons, barium salts, hydrocyanic acid, cyanides and nicotine, in any vehicle in which food is being transported, unless the food is carried in a part of the vehicle effectively separated from that containing the poison, or is otherwise adequately protected from the risk of contamination.

(8) A fuller explanation of the requirements of the Act and Rules affecting farmers or horticulturists is to be found in the Home Office memorandum "Poisons No. 4 (Agriculture and Horticulture)," which may be purchased directly from H.M. Stationery Office at the following addresses:—

Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh, 2; York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller. Price, 2d. net (2½d. with postage).

The Purchase of Poisonous Insecticides, Fungicides and Weedkillers, by Amateur Gardeners

UNDER the Pharmacy and Poisons Act of 1933, and the Poisons Rules, 1935, amateur gardeners or horticulturists—i.e., those not engaged in growing plants as a trade or business—are in a different position from the professional in respect of the purchase of poisonous insecticides and fungicides. The following note, which is not intended to be comprehensive, indicates the procedure that must be observed by the amateur in obtaining certain of the more generally used horticultural poisons.

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(1) Under the Act, retail sellers of these poisons are divided into two categories:—

A.—*Authorized Sellers of Poisons*—a category confined solely to those who keep chemists' shops.

B.—*Listed Sellers of Part II Poisons*—who comprise horticultural sundriesmen, ironmongers and other shopkeepers who are registered by the Local Authority for the retail sale of certain of the more commonly used poisons.

(2) The amateur may obtain the following insecticides and fungicides *only from a chemist's shop*:—

Mercuric chloride and other mercuric substances; sodium arsenite and arsenical weedkillers; sodium and potassium cyanide.

When purchasing these poisons the purchaser must sign the "Poisons Book" of the seller. Moreover, if the purchaser is not known to the seller to be a person to whom poisons may properly be sold, he must produce a certificate to this effect, signed by a householder known to the seller as a responsible person of good character.

(3) The amateur may obtain either from a chemist's shop or the shop of a listed seller of Part II poisons, the following poisons:—

Barium silico-fluoride; calcium arsenate; lead arsenate; nicotine; Paris green (copper acetoarsenite).

When purchasing any of the above poisons, the purchaser must sign the "Poisons Book" and be known to the seller as indicated in the previous paragraph.

(4) It should be noted that the amateur cannot purchase by post any of the poisons of which the sale involves the signing of the Poisons Book.

(5) Most of the other poisons likely to be required by the amateur—e.g., barium carbonate in rat poisons, sodium fluoride, formaldehyde, and caustic soda—may be obtained either from a chemist's shop or the shop of a listed seller of Part II poisons without formality, and, in such instances, he may purchase by post.

(6) A fuller explanation of the requirements of the Act and Rules affecting amateur horticulturists is to be found in the Home Office memorandum "Poisons No. 4 (Agriculture and Horticulture)," which may be purchased directly from H.M. Stationery Office at the following addresses:—

Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh, 2; York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller. Price, 2d. net (2½d. with postage).

The Problem of Nutrition*

To the three volumes under the above title, noticed in the issue of this JOURNAL for September last (p. 514), a fourth volume has now been added. This last contains a wealth of statistical data relating to the production, consumption, and wholesale and retail price movements of a number of protective and other foodstuffs. The volume was specially prepared by the International Institute of Agriculture, whose Year Book of Agricultural Statistics has hitherto lacked the data concerning food consumption, which have now been so usefully collected. It is to be hoped that future Year Books will regularly include current information upon this important aspect of agricultural statistics.

The provisional and unsatisfactory nature of many of the estimates of production and consumption is emphasized in the introduction to the volume, and one of the important services which it will almost certainly render will be to draw attention to these deficiencies in the field of food-consumption statistics and lead the competent authorities to secure an improvement.

Imperial Agricultural Bureaux: Executive's Report

THE Executive Council of the Imperial Agricultural Bureaux is a unique organization in the Empire, being composed of representatives of the Dominions and Colonies that contribute to the support of the Bureaux. It exercises a direct executive control over the eight Imperial Agricultural Bureaux and the Imperial Institutes of Entomology and Mycology, which are thus servants of no one member of the British Commonwealth of Nations, but of all collectively.

The Bureaux have, as their chief function, the collection and dissemination of information of value to agricultural science on their respective subjects—entomology; mycology; soil science; animal health, nutrition and genetics; fruit production; plant genetics (herbage and non-herbage crops); and parasitology. In addition, the Imperial Institutes of Entomology and Mycology undertake the identification of specimens submitted.

The Seventh Annual Report of the Executive Council, just published, records a steady increase both in the services

* *The Problem of Nutrition: A World Survey by a Committee of the League of Nations.* Vol. IV. Statistics of Food Production, Consumption, and Prices. 1936. (Geneva: League of Nations Publications Department. London: Allen and Unwin. Price 3s.).

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provided and in the use made of those services;* and the separate reports of the bureaux and institutes, which form appendixes to the Council's report, emphasize this growth, and illustrate the diversity of the requests received and the services rendered. Special mention may be made of the report of the Parasite Laboratory attached to the Institute of Entomology, which has had some notable successes in the control of insect pests and of weeds by utilizing parasitic insects inimical to them.

Conference on Mechanized Farming, 1937

THE Second Conference on Mechanized Farming will be held at Rhodes House, Oxford, on January 5-8, 1937, under the joint auspices of the School of Rural Economy, the Agricultural Economics Research Institute and the Institute for Research in Agricultural Engineering of the University of Oxford. Mr. C. S. Orwin (Director, Agricultural Economics Research Institute) will open the proceedings at 2.30 p.m. on January 5, his address being followed by a paper on "Tractor Performance in Theory and Practice" by Messrs. S. J. Wright and E. B. Black (Institute for Research in Agricultural Engineering). There will then be given three papers on "Practical Experiences with Row-Crop Equipment," Mr. Newcome Baker (Sedgeford) dealing with sugar-beet, Mr. F. W. Rockcliffe (West Walton) with potatoes, and Mr. D. R. Bomford (Pitchill, Evesham) with market garden crops in general. The Conference Dinner will be held in Christ Church Hall at 8 p.m. The meetings on the three following days will open at 9.30 a.m. On January 6, papers will be read by Dr. B. A. Keen (Rothamsted Experimental Station) on "The Scientific Basis of the Art of Cultivation," by Mr. C. Culpin (School of Agriculture, Cambridge) on "Some Modern Cultivation Problems," and by Mr. A. Amos (Spring Grove, Wye) on "A Practical Farmer's Views on Cultivation." At 4.30 p.m., there will be an open discussion on "Maintenance of Fertility," in which Sir Albert Howard, Dr. E. M. Crowther and Messrs. W. D. Hollis and D. R. Bomford will take part. The discussion will follow an introductory address by Mr. D. Skilbeck. On January 7,

* Imperial Agricultural Bureaux: Seventh Annual Report of the Executive Council, 1935-36. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller, or from the Secretary, Imperial Agricultural Bureaux, 2, Queen Anne's Gate Buildings, London, S.W.1, price 5s., post free, 5s. 3d.

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Mr. E. J. Roberts (University College of North Wales) will review "A Year's Progress in Grass Drying," followed by three papers on "Practical Experiences with Grass Drying Equipment," Mr. A. G. Bazley (Hatherop) dealing with the Curtis-Hatherop drier, Mr. J. E. Chambers (Wanborough) with the Ransome drier, and Col. R. Vaughan-Williams (Uttoxeter) with the I.C.I. drier. Other papers that will be given are "The Production of Dried Grass and its Cost," by Messrs. R. N. Dixey and R. P. Askew (Agricultural Economics Research Institute), and "Some Speculations as to the Future of Grass Drying," by Professor J. A. Scott Watson. On January 8, Mr. J. E. Newman (Institute for Research in Agricultural Engineering) will give "A Review of Combine Harvesting in 1936," Mr. A. J. Hosier (Marlborough) will speak on "My First Year with the Combine," and the closing address will be delivered by Dr. H. J. Denham (Director, Institute for Research in Agricultural Engineering). The programme includes visits to engineering works and places of interest on the afternoons of January 6 and 7. Further particulars may be obtained from The Conference Secretary, 10, Parks Road, Oxford. The accommodation for the Conference being strictly limited, early application for tickets is advisable.

The World's Grain Crops

A REPORT on "Grain Crops,"* published by the Imperial Economic Committee, summarizes in the form of a statistical analysis the world production of and trade in certain grain crops during the period 1928 to 1935. The crops with which the report deals, namely wheat, barley, oats, maize and rice, are those of most importance to British countries. The work, while supplying a valuable statistical survey of the international trade in these commodities during the period reviewed, is limited somewhat in its analysis of world production by the absence of reliable information from certain countries.

It is shown that the world production for the five cereals in 1934 was lower than the average for the years 1928-1933. The British Empire accounted for roughly 23 per cent. of both acreage and production, although rice grown in the

* Grain Crops : A Summary of figures of Production and Trade relating to Wheat, Wheat-flour, Barley, Oats, Maize and Rice. Compiled by the Intelligence Branch of the Imperial Economic Committee. Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 2s. 6d., post free, 2s. 8d.

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Empire alone amounted to 60 per cent. by acreage and 56 per cent. by weight of produce of the world's total production (excluding China). From the estimates of the International Institute of Agriculture, however, it is apparent that the Empire share of the total would have been considerably lower if it were possible to include the production of China. A feature of this period has been the increased production of wheat, barley and oats in the U.S.S.R., which during recent years has replaced the U.S.A. as the world's largest producer of these commodities. At the same time there has been a considerable diminution in the production of all these cereals in the U.S.A. Within the Empire, India is now the largest producer of both wheat and barley, in addition to maize and rice, although this position has been achieved, not so much by increased production in that country, as by a decline in Canadian production.

The most welcome result of the increased production of cereals in various countries has been the improvement in the world wheat situation. The encouragement given to wheat-growing in various European countries, aided by increased restrictions on imports, led to the accumulation of large stocks, reaching a peak in 1934 when the carry-over was estimated at over 31 million tons. Reduced acreage and drought have led to a gradual liquidation of stocks, the forecast of 16½ million tons for 1936 being lower than in any year since 1928. As a result, 1935 saw an advance in prices to the highest level reached since 1930.

The report draws attention to the serious decline in the world trade in cereals since 1928, particularly to the decreased trade between North and South America and Europe, the exports from the U.S.A. having fallen from over 5½ million tons in 1928 to a little over ½ million in 1935, and Canadian exports from the abnormally high figure of 11½ million tons in 1928 to 5½ million in 1935. Against this, gross imports into Belgium, France, Netherlands, Germany, Switzerland, and Italy, have fallen from 17½ million tons in 1928 to less than 9 million in 1935. The U.S.S.R. had in the period under review, only temporary importance as an exporter of its primary cereals, a sudden increase in the quantity of exports in 1930 and 1931 being followed by considerably reduced totals in succeeding years. A section of the report is devoted to the various forms of European import restriction which have contributed to this shrinkage in the European market.

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In dealing with the various crops individually, special attention is paid to the position of the Empire, and, in particular, to the United Kingdom, with regard to the world trade in these commodities. In spite of the fact that India is no longer an important wheat exporting country, the post-war increase in the production of Canada and Australia gives the Empire a net annual surplus of wheat and wheat flour. India normally has a surplus of rice sufficient to meet the requirements of other parts of the British Commonwealth, but for other cereals, particularly maize, the Empire must depend on foreign sources of supply.

Throughout the period, the United Kingdom has been by far the largest buyer of wheat and wheat flour, and in spite of the imposition of import duties in 1932 on wheat and wheat-flour from foreign countries, the volume of imports has not fluctuated to any marked extent during the eight-year period. In 1928 the imports of barley into Germany were far in excess of those into this country, but on account of the rapid decrease in German imports, the United Kingdom is now easily the most important of the principal importing countries. The volume of imports of this cereal into the United Kingdom has shown an irregular increase. On the other hand, the imports of oats had declined in 1934 to under one-half of the 1928 total, and Switzerland, with a tendency to increase its purchases, had become the chief importing country. The provisional 1935 total for maize imported into the United Kingdom was almost double that of the 1928 level, while the trade in rice in this country has been fairly constant since 1928.

In addition to the statistics of world production and trade in these cereals, an indication of ruling prices is given by tables showing the monthly average prices for specified grades of each cereal in this country during the period 1929 to 1935. These complete the survey of a period that began with a steadily falling price level and ended with a gradual recovery in the cereals market.

Voluntary Service

Voluntary Service is the title of the 16th Annual Report of the National Council of Social Service of 26, Bedford Square, London, W.C.1. The patron of the Council is His Majesty the King; the President is The Rt. Hon. the Viscount Bledisloe, P.C., G.C.M.G., K.B.E., the Chairman is the Warden of All Souls (Dr. W. G. S. Adams, C.H.); and the Vice-Chairman, Mr. R. C. Norman. The Chairman of the

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Unemployment Committee is Dr. A. D. Lindsay, C.B.E. (Vice-Chancellor of the University of Oxford). As a record of a year's work in many directions in which social service is urgently required, the Report is an important and, to those unacquainted with that field of labour, an arresting document.

A large part of the Council's energies has been devoted to the furtherance of voluntary work with unemployed people who stand in real need of opportunities for activity to break the monotony of idleness. The Report shows something of what is being done in that direction by voluntary effort, though admittedly the Council's work, and its inspiration of others to work, cannot cover more than a small part of so large a subject. To understand what is being done and what can be done even in this limited field, one has to see the interesting descriptive photographs in the document and to read the Report itself. To all those who desire to lend a hand in helping to ameliorate the hard lot of the unemployed, there can be no more helpful and inspiring a document.

A subsidiary matter is the progress in rural industries development through the agency of the Rural Industries Bureau in London and the Rural Community Councils in certain counties. This shows definite and encouraging advance and the enterprise might usefully be extended to other counties of Great Britain. The Report can be obtained, price 1s. net, from the Council's offices.

Agricultural Machinery Testing Committee

CERTIFICATE AND REPORT NO. 64 in respect of the test of the Barford Invicta Boiler and Sterilizing Chest have now been published in pamphlet form. The test, which was carried out at the National Institute for Research in Dairying, was in two parts. In the first part, the boiler only was tested, and the evaporation rates, heat balance, fuel consumption and steaming efficiency were determined when it was operated with a hand-force feed pump and with a steam-injector feed. In the second part, the complete installations were tested under working conditions, in which measurements were taken of operating times for efficient sterilization with the chest full of tinned-steel utensils and the chest full of glass bottles.

Full details of the test are given in the pamphlet, copies of which can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 3d. (by post 3½d.) each.

THE APPLICATION OF SCIENCE TO THE POULTRY INDUSTRY*

PERCY A. FRANCIS, O.B.E.,

Poultry Commissioner, Ministry of Agriculture and Fisheries.

THE modern practice of poultry husbandry is an art. Now an art may be defined as the application of knowledge to effect a desired purpose, or the performance of certain actions requiring not only the possession of knowledge but the skill to apply it.

Science may broadly be defined as knowledge in general or as a collection of the general principles or leading truths on any subject. Such knowledge may be acquired through study, experience, observation, and by deliberate investigation, experiment and research. The degree of knowledge that human beings possess on any subject, seldom remains stationary for any length of time, but generally increases more or less rapidly—sometimes very rapidly indeed.

Now, much has been learnt in the course of time of science in relation to poultry husbandry, but, as the main objective of most poultry-keepers is to make as big a profit as possible from their efforts, commercial considerations have largely governed the extent to which science or knowledge, whether old or new, has been applied to the industry. It is known, for example, that, by certain operations, the sexual character of a fowl can be altered so that the female looks and behaves as a male, and *vice versa*: but this knowledge, so far at all events, is not capable of profitable commercial application in the industry. On the other hand, the knowledge that by caponising a cockerel its capacity for producing table meat is greatly increased, has led to the application of this knowledge to commercial practice in many countries. These examples illustrate, therefore, why it is that some of our existing knowledge—we may call it scientific knowledge if we like—is not applied in practice. Do not let us, however, despise that sort of knowledge, for we never know when it may become commercially useful. For example, Gregor Mendel, the Austrian monk, no doubt little thought, when he

* A paper read in connexion with the British Association meeting at Blackpool, 1936.

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wrote his famous treatise on the mode of inheritance of certain characters in peas, that his work would affect the methods of poultry-keepers generations afterwards. Nor did the discoverers of vitamins imagine, at all events at first, that their discoveries would later on help poultry-keepers to prevent "leg weakness" in their chickens.

The application of science to the poultry industry is not only governed by considerations of commercial expediency. It is also influenced by the immediate conditions of the industry and its future prospects. In the middle, and until nearly the end, of the last century, poultry-keeping was not so much an industry as a despised and tolerated adjunct to farming practice and was conducted chiefly on scavenging lines. The farmer, as a rule, was firmly convinced that poultry-keeping was not profitable except to the women of his household, and therefore, he took little or no interest in it and refused to spend money either in buying good food for the birds or in trying out new methods based on such knowledge as was then actually available. Similarly, there were then practically no scientific research workers or investigators seeking for further knowledge, partly because there was no money available either from private or State sources to pay for their services, and partly because there were few trained investigators or research workers in existence in this country.

Towards the beginning of this century, however, more attention was drawn to the possibilities of the industry. Profits from arable agriculture had become difficult to achieve. The dairying industry was expanding, and more and more arable land was being laid down to pasture, thus providing more suitable agricultural conditions for an expansion of poultry-keeping. The demand for eggs and poultry for the table was increasing, and the sums paid annually to other countries for these products were growing into many millions. Meantime, developments were taking place in America, where work in poultry education and research was expanding and new methods of the large-scale intensive and semi-intensive types were being tried. These American developments began to influence opinion and practice in this country, and simultaneously the effects of the extension of poultry education in England, made possible through funds available under the Technical Instruction Act of 1899, and the Local Taxation Act of 1890, began to appear. A few attempts to establish specialist poultry farms were made. Farmers

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commenced to keep poultry in portable houses out in their fields, and, influenced no doubt by the proximity of the good markets offered by the populations of adjacent large industrial areas, there was laid the foundation of the huge development of the industry that has since taken place in Lancashire.

All these developments were accompanied with many failures, and exposed many unexpected difficulties, which existing knowledge was insufficient to solve. No doubt some of the difficulties that caused failures and financial losses to poultry-keepers had been experienced by the older type of farm poultry-keeper many years before; but since the farmer at that time was not usually interested in his birds and anyhow expected no profit to himself from them, a few deaths more or less in the flock or in the young chickens, or a partial or even total absence of eggs did not greatly concern him. In any event the birds were mainly scavengers, while the fact that they had free range round the farmstead, were kept in limited numbers and under such rigorous conditions that they simply had to be healthy or die, meant that the death rate was actually much lower, on the average, than with birds kept in larger numbers and under more congested conditions, even though the latter might be better fed and managed.

A demand for more knowledge gradually arose and has continued to grow, but though poultry-keeping continued to expand slowly, this demand was not yet either sufficiently insistent or extensive to secure any appreciable expansion in the provision for education, investigation and research. A good deal of progress was made, however, in the adoption of better methods by the more intelligent poultry-keepers, who derived some assistance and stimulus from a study of developments in other countries, and at the same time experimented for themselves in a practical way. These experiments, however, often proved costly, and generally there was little confidence in the possibility of making a satisfactory profit from the production of eggs and poultry for the table—the principal and only foundation on which the poultry industry as a whole can rest.

Then came the Great War, with its scarcity and abnormally high prices. The active interest of the Nation was turned to the problems of food production, and with the end of the War began the boom in poultry-keeping. This boom attracted new types of poultry-keepers drawn from every class, every profession, every business and every occupation :

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the ex-soldier, the ex-sailor (able-bodied or partially disabled), the ex-engineer, ex-anything! Many of these newcomers were highly educated, highly intelligent; and many of them were competent in business acumen and experience, and full of energy, initiative and ideas. Unfortunately, most of them were without any experience of the industry they were entering, and many possessed little or quite insufficient capital. The newcomers of the better type were accompanied by large numbers who were quite unfitted—temperamentally, financially and physically, as well as in experience and knowledge—for the adventure on which they were starting. So, in spite of the favourable conditions offered by the industry—conditions that continued more or less for nearly a decade—there were many failures.

In spite of these difficulties, however, the industry in this country experienced the most rapid period of expansion in its history—an expansion that was accompanied by a rapid increase in knowledge of the fundamental principles of poultry husbandry and in the efforts made to apply this knowledge to commercial practice. This expansion was no doubt due largely to the favourable economic conditions that then existed for poultry-keepers. The War had heavily depleted poultry stocks in nearly every country, and this depletion was particularly felt in Britain, which for many years before the War had been accustomed to depend for nearly 70 per cent. of its annual consumption of eggs on supplies from overseas. Further, public taste was moving towards lighter foods, such as eggs, fruit, etc., and away from the heavier foodstuffs. Then, too, the prices obtainable for home produced eggs compared very favourably with those obtainable for other farm products, and also with the cost of the feeding stuffs required by the birds.

The greater demand for, and appreciation of knowledge, shown by both the new and the older types of poultry-keeper, and the efforts made to apply this knowledge, not only by the poultry-keeper but by the poultry appliance maker and the poultry-feeding-stuff merchant, played an important part in the advance. This change in the mental attitude of the poultry-keeper towards science was supported by the State, and, through the Ministry of Agriculture, the Development Commission and, more latterly, the Agricultural Research Council, greatly increased funds were made available for education, investigation and research in connexion with the

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many problems and difficulties, both old and new, which this rapid expansion threw up vividly to the surface. County and Agricultural Institute staffs for poultry educational work were greatly increased. New Research Institutes were established, or the staffs of existing Institutes expanded, and immeasurably greater facilities were created for investigating the problems of disease, nutrition, economics, breeding and marketing, than existed in pre-War times.

How, then, has this increase in knowledge of the scientific truths relating to the numerous activities of poultry husbandry affected its practice? How has the science of poultry husbandry influenced the art?

The finding of an answer to these questions involves consideration of the sciences relating to the poultry-keeper's work, and if we examine the syllabus of the National Poultry Diploma Board, which sets out the subjects that must be studied by candidates for the National Diploma in Poultry Husbandry, we can see how numerous these sciences are—biology, chemistry (organic and inorganic), and physics; anatomy, physiology and pathology. It should be remembered, too, that though our knowledge of the way in which these sciences can affect the art of poultry husbandry has been greatly extended in recent years, there is a vast field still to be explored and charted. We have not yet learnt how to avoid or control some of the poultry diseases and the heavy rate of mortality which still imposes so serious a handicap on the industry. We have still much to learn regarding the nutrition of the fowl and its relation to disease and mortality and unthriftiness; and, in the field of breeding and the methods of inheritance of desirable economic qualities, our knowledge is still very limited.

Poultry Diseases. Let us, first of all, examine the subject of poultry diseases—their prevention and control. Some idea of the importance of this subject to the industry may be gathered from the fact that the State has recently set up a Special Committee to inquire into the causes of the high mortality in poultry. The National Veterinary Medical Association has estimated that the monetary loss caused annually through mortality amongst poultry in this country amounts to £4,000,000 per annum. In America, this loss is put at £11,000,000 per annum. What this sum might have amounted to in this country if our scientific knowledge had

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not become greater than it was, say, 20 years ago, can be imagined even if it cannot be definitely calculated.

Bacillary White Diarrhoea.—Take, as an example, the extent of the financial loss incurred some years ago through the ravages caused by bacillary white diarrhoea before the application of the agglutination test, which was devised in 1913. To-day, with the aid of millions of these tests applied annually, this disease is not regarded as a serious menace by poultry-keepers who test their flocks regularly. Further, many thousands of poultry-keepers who annually require to purchase large numbers of day-old chicks and eggs for hatching, as well as adult stock birds, depend upon this test to guard them from the dangers arising from the introduction of the disease to their premises. Many breeders of pure-bred stock and the large commercial hatcheries would find it difficult, if not impossible, to do business if they were unable to offer their customers the safeguard provided through the discovery and application of this test; and not only can it be used to discover "carrier" birds of bacillary white diarrhoea, but also those infected with fowl typhoid, and "carrier" ducks infected by other *Salmonella* micro-organisms, *S. ærtryke* and *S. gærtner*.

Fowl Pox.—One of the best known and most troublesome diseases used to be fowl pox, often erroneously call roup. Few poultry yards were free from occasional outbreaks, and though the rate of mortality might not be high, the disease, through its persistence over long periods and its injurious effects upon the birds, caused considerable loss, trouble and expense, particularly as individual and daily treatment of the birds was often attempted. Nowadays the discovery of a vaccine that produces immunity in unaffected birds for a period of from four to six months enables the poultry-keeper, with its aid, to check the spread of this disease and, by killing off the affected birds, to eradicate the disease from his farm.

Fowl Typhoid is an acute infectious disease, world-wide in its distribution. Sometimes the development of this disease is very rapid and mortality may be as high as 80 per cent. As already stated, carrier birds of this disease may be detected by the agglutination test, and it is important that this test should be applied, for these carrier birds, as in the case of B.W.D., harbour and transmit the causal agent of the disease, but may themselves give no outward signs of being infected. A vaccine is also now available for the inoculation of uninfected birds in the flock.

Coccidiosis.—It is often stated—probably with much justification—that coccidiosis causes annually more loss to the industry than any other single disease. It is true, unfortunately, that our knowledge regarding this disease, its prevention and eradication, is yet far from complete. We do know, however, that there are at least six different kinds of coccidia that may cause this disease, and that though a chicken that has recovered from an attack from one of these kinds may become resistant to a subsequent attack from the same kind, it is not immune from attacks from the other five. We know, too, that the disease cannot develop to a very dangerous stage without repeated re-infestation, which takes place from continued contact between the birds and the infected droppings. If, therefore, the chickens are kept as little as possible in contact with droppings, the progress of the disease can be checked and possibly eliminated. For this reason chicks are now often reared on wire floors, which permit infected droppings to pass through and be removed. This system is, of course, more difficult to adopt with older birds, though the use of laying batteries, which seems to be extending, may partially overcome this difficulty.

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The above examples show some of the outstanding instances where science has definitely been applied to the industry in connexion with disease prevention and control, but there are many other ways in which the increase in our knowledge of the causal agents of disease and their life history and habits have enabled poultry-keepers more effectively to apply practical counter measures.

Blackhead in turkeys and *Gapes* in chickens may be largely, if not entirely, avoided by rearing the birds under intensive conditions on wire floors. In blackhead the principal source of infection is from land contaminated by the droppings of affected birds. A bird apparently in good health may act as a carrier and thus give rise to an outbreak of disease. As regards the gape-worm, which only rarely affects chickens after they are over 4 weeks of age, the bird picks up from the ground either the free larva or an earthworm or snail containing the larvae, and so becomes infected. Eggs from the gape-worms actually in the windpipe of the bird find their way into its mouth and finally pass out in the droppings, to develop in turn into fresh larvæ.

Our knowledge of other worm diseases affecting poultry has also expanded, though definite practical methods of prevention and control have yet to be discovered. We do know, however, that parasitic worms do not multiply within the body of the fowl and that of the large numbers of eggs—sometimes millions—which each parasitic worm is able to produce, not one comes to maturity within the bird, but only does so after being voided with the bird's droppings and then spending varying periods outside. This knowledge has led—as with other diseases—to the adoption of methods for disinfecting both plant and land; and whilst much has been learnt from science which has enabled these methods to be made more efficient, especially as regards disinfection of poultry houses and appliances, the attempts to disinfect the soil are only partially successful.

Apart from these concrete examples of the application of science to methods for the prevention and control of disease, it should be remembered that through the spread of education large numbers of poultry-keepers to-day are able to recognize the initial symptoms of many common poultry diseases and know what initial measures to take, or are ready to call in expert advice in the early stages of an outbreak.

Nutrition. If we turn to the field of nutrition we also find that much progress has been made. If we look back a few years before the War and think of the rations then given to poultry and compare them with those in use to-day, we can realize how great an advance has been made. A continuous diet of wheat, maize, oats or barley, was often given, and the grain was frequently of poor quality. On many farms a wet mash of barley meal, supplemented at night with grain screenings from the threshing mill, or similar poor stuff, was the

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regular diet of the birds. Chickens were often reared on nothing but small wheat, oatmeal or cracked maize. It was fortunate that most of the birds so fed were kept on more or less free range or round a farmstead and were thus able to supplement their rations from other sources. Even so, the average egg yield obtained was usually very low, and eggs in winter-time were mostly conspicuous by their absence.

The intensive and semi-intensive poultry plants on the scale on which they exist to-day could certainly not continue to function for long if they had to use the feeding methods practised in those old times. Practically nothing was known of the fowl's capacity to digest the various kinds of feeding stuffs available. Nothing was known of the daily requirements of the bird for maintenance, growth, and production, at various levels; and little was known of the daily needs in protein or starch equivalent. Vitamins were undiscovered and mineral supplements scarcely thought of, though a few of the old exhibition breeders often gave bone meal to their young chickens, as well as a chemical mixture of phosphates (from a bottle).

Nowadays, heavy laying strains of poultry have been developed; high average yields are expected from commercial laying flocks; chickens are expected to make rapid growth and the birds must be able to fatten well; chicks are reared intensively on large-scale lines in houses that allow only restricted amounts of sunshine; hens are kept under similar conditions in laying batteries. How long could these developments and new methods be sustained if our knowledge of the nutrition of the fowl were only what it was twenty—or even ten—years ago? Most of us can remember how difficult it used to be to rear winter chickens, which had to be given protection from the weather, and how often these birds went down on their legs, or refused to thrive or even live. We also remember how often the early attempts at intensive poultry-keeping failed mainly because the essential factors of vitamin supply, adequate sunshine and fresh air were not understood. The whole history of the development of the battery system of rearing chickens is full of examples of the all-important influence of nutritional factors. How many of those who now rear thousands of chickens annually on this system would have the courage or the foolishness to continue to use these methods, if it were not for the knowledge of the nutritive and hygienic requirements of battery-reared chicks

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made available by the numerous investigators and scientific workers during recent years.

It is only necessary to examine the ingredients of up-to-date poultry mashes—chick mash, grower's mash, layer's mash, breeder's mash, etc.—to see how the results of the scientific knowledge on nutrition acquired by the experimenter and the research worker have been incorporated into the daily practice of the poultry-keeper. These mashes contain proteins, carbohydrates and fats of the right kind and quantity, and the necessary vitamins and minerals. The ingredients must be fresh and in proper mechanical condition, sufficiently digestible and of adequate bulk; while they are incorporated and blended in varying quantities and proportions, according to the age and future purpose of the birds and the system of management under which they are kept. In fact, our knowledge of the nutritive requirements of the fowl in its various stages of life and activity has advanced so far, that it is possible to estimate, with fair accuracy, the daily requirements of the laying hen, according to the body-weight and rate of egg production. It is not possible here to deal in any detail with this subject, but those who may desire fuller information are recommended to study the Ministry's Bulletin No. 7 (*The Scientific Principles of Poultry Feeding*),* written by Mr. E. T. Halnan, M.A., of the School of Agriculture, Cambridge.

Genetics, Anatomy and Physiology. Let us turn now for a few moments to the field covered by genetics, anatomy and physiology, and see how far these sciences have been applied in practice. Within this field, the work of scientists such as Bateson, Punnett, Pease, Goodale, Pearl, Crew, Greenwood, Dunn, etc., has been of much influence and value. The name of Professor Punnett in particular will always be remembered in the poultry world, especially for his work on sex-linked inheritance. During his investigations at Cambridge, it was found that the hen, when mated according to definite principles, transmits certain characters to her male but not to her female progeny. Most of the characters that have been so far investigated in domestic poultry are transmitted on Mendelian lines; that is to say, either parent transmits them

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Temporarily out of print. The 4th (revised and enlarged) Edition is now in the press.

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equally to either sex of the offspring. A few characters, however, are transmitted by the hen solely to her male offspring. Four of these characters have become of commercial importance, for they enable the sex of chickens from certain first crosses—and more latterly from one pure breed—to be distinguished when hatched. These four characters are (1) Silver ground colour of plumage and down as opposed to Gold; (2) Barred plumage (such as is found in Plymouth Rocks) as opposed to Unbarred plumage; (3) certain forms of light-shank colour as opposed to dark-shank colour, and (4) slow feathering as opposed to rapid feathering.

This scientific knowledge has become of great commercial importance, since it not only enables the large commercial hatcheries—which, taken together, distribute millions of cross-bred day-old chicks annually to their customers—to supply pullets or cockerels only as desired; but it enables the smaller poultry keeper, if he wishes to do so, to dispose of his male chicks at birth and to utilize the whole of his rearing capacity for his pullet chicks. With the development, in recent years, of large commercial egg-producing plants that require only pullets and hens for their purposes, this breeding method is also of much benefit. It should be stated that so far only one pure breed showing automatic sex-linkage within the breed, namely the Cambar, has been developed; but a pure breed of duck and another pure breed of fowl are in course of development at Cambridge, and there seems to be no reason why other breeds of fowls showing automatic sex-linkage should not be developed.

Another important application of science to practice has made commercial “sexing” of chickens and ducklings possible. This practice appears to have been in use in China for centuries past, and was demonstrated in this country by Crew at Edinburgh some years ago. It was, however, in Japan that the art of chick sexing was developed into a commercial practice, and skilled Japanese operators carried this practice into many other countries. Its successful operation depends upon the capacity quickly to recognize the difference between the sexes as regards the appearance of the sexual organ situated in the vent, and upon delicacy of touch in handling the chicken. This method enables the sex of any breed of chicken to be detected with a high degree of accuracy when hatched—about 95 per cent. with skilled operators. It is not so accurate a method as that available through sex-linkage, and sometimes damage is done to the birds in handling them. Sexing operators, however, are now employed by many of the large hatcheries both here and in other countries, and the practice has become commercially important.

Poultry Appliances. If we next consider poultry appliances and their accessories now in use, we can again observe how science has assisted practice. Perhaps an outstanding example of this fact is the modern incubator. It is true that artificial incubation was an ancient practice in both China and Egypt, but the primitive egg ovens of Egypt would scarcely be suitable for the needs of British poultry husbandry to-day, as they are much inferior, as regards facilities for

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control and ease and economy of working, to our modern mammoth incubators.

It is interesting, however, to note that, according to records made by the Statistical Service of the Egyptian Ministry of Agriculture, there were in 1915-16 over 33 million eggs hatched in some 570 Egyptian egg ovens, the percentage of chickens hatched to eggs laid down varying from 57 to 73 per cent. The capacity of these ovens varies from 24,000 to 90,000 eggs each. They are built of bricks made from sun-dried Nile mud, and are usually rectangular in shape, containing two compartments—an upper and a lower—and have dome-shaped roofs. The heat is supplied by burning chopped bean straw mixed with dried cakes of horse or cattle dung. Thermometers are not used, but the temperature is judged by the operator putting an egg against his eyelid. The temperature, according to recorded particulars, varies daily from the first to the eleventh day from 95° F. to 104° F., and afterwards remains practically constant around 94° F. After the eleventh day, no heat except that provided by the developing embryos in the egg is supplied. The eggs are moved in rotation three times a day for the first seven days, and afterwards twice daily. They are tested after the seventh day by holding each egg in front of an olive oil lamp, or against the sun's rays coming through an aperture in the roof. As the method of working these ovens is regarded as a traditional secret in certain families, a high degree of skill is usual amongst the operators.

It is claimed by some writers that the art of hatching eggs artificially was introduced into Europe by two scientific members of Napoleon Bonaparte's expedition to Egypt. At any rate, it is known that Réaumur, a French scientist who experimented about the middle of the eighteenth century with artificial incubation—and incidentally invented the thermometer—was one of the pioneers of the modern incubator. He investigated the part played by humidity in artificial hatching, and it is interesting to note that nearly 200 years later his conclusions were generally corroborated by Romanoff, a research worker in America. The investigations of other workers in connexion with the composition of air, air movement and atmospheric pressure in the hatching chamber, and investigations into the physics of incubation, such as those of Chattock at Bristol, have all played their part in the development of the modern machine that occupies so important a place in poultry husbandry to-day. The thermometer and the thermostatic capsule combine to make this machine infinitely superior to the ancient egg oven of former times. The modern incubator, too, illustrates the most outstanding example of the application of the science of electricity to poultry husbandry, for, with a mammoth machine, electricity is often used not only as the source of heat, but also as a source of power for driving the fan that forces warm and fresh air over the eggs, and—in the case of certain machines—even for automatically moving the eggs at regular intervals. Poultry-keepers who enjoy the facilities provided by the modern incubator for hatching eggs probably seldom give a thought to the laborious work, done by numbers of scientists in former years, which has made possible the development of the modern machine.

The application of electricity to poultry husbandry may be observed in numerous other instances. Electric heat is now used for hovers and battery brooders, and through the skill of the electrical engineer, various types of heating units are available—luminous heat, dark heat, and an open heater providing radiant heat. Electric power is applied to egg-grading machines, plucking machines, food mixers, and sometimes to corn mills. Many poultry farms use electric lighting both for outside

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and inside purposes, especially for putting the birds under "lights" in the winter months. It is also used for egg-testing machines. In fact, the application of the science of electricity to poultry husbandry affects intimately the daily life of so many poultry-keepers that any idea of going back to non-electric methods would be to them unthinkable.

Storage. We may now briefly examine the part played by science in the storage of eggs and poultry. Methods of preserving eggs have been adopted for generations past, the older methods depending mainly upon the slowing down of the rate of evaporation of the moisture content of the egg. The lime-water and water-glass-solution methods not only check this rate of evaporation but also inhibit the development of putrefying bacteria and moulds, and probably slow down the rate of oxidation of the egg contents, which, during storage, tend to become thin and watery.

A combination of knowledge of chemistry and engineering and its practical application has produced the refrigerator or cold-store, which nowadays is much used both in this country and overseas, and on board ship, for the preservation of eggs, and to a smaller extent for the preservation of table poultry. Mr. H. W. Pasteur, in a paper read before the British Association of Refrigeration, states that: "the most common method of refrigeration is the compression system, the most commonly used mediums being ammonia, carbon dioxide, methyl chloride, and sulphur dioxide. The process consists of:

- (1) Evaporation of the liquid of constant pressure and temperature at a low level, the heat of evaporation being drawn from the surrounding medium, such as air, brine or water.
- (2) Compression of the evaporated gas to a high pressure and temperature.
- (3) Removal of superheat, latent heat, and sensible heat at constant pressure causing the liquefaction of the medium.
- (4) The passage of the liquid through a throttle valve from the high pressure to the low pressure side.

Shell eggs can be stored for several months at 32° F. but it is very important to maintain an even temperature and a humidity of about 85 per cent. If the air is too dry, the eggs lose weight and shrink; and, if it is too damp, mould frequently forms on them.

Small chilling rooms are now found on a few large poultry farms where table-poultry production is carried out on a fairly extensive scale. The chilling room is used to cool the birds before they are packed and sent to market, thus avoiding complaints, especially prevalent during hot weather, that when the birds reach the markets they have become green and unfit for sale.

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A new method of storing eggs has now been developed in which the eggs, after having the air in them extracted in a vacuum and being kept for a short period in a mixture of CO_2 and nitrogen, are stored in a steel chamber with a similar gaseous mixture.

A large store of this type has now been in operation for some years in this country and there are about a dozen altogether in Europe. It is claimed that this method gives excellent results, since the gaseous mixture in which the eggs are stored inhibits in the white and yolk chemical changes that often produce a thinning or watery appearance of the egg contents in stored eggs, and that it also prevents the appearance of moulds and bacteria whatever the percentage of humidity. It is also claimed that after long storage, the air-space of the egg is very small; that no sweating occurs in the eggs when they are removed from the egg stores; and that they then actually keep in good condition longer than eggs laid on the day the gas-stored eggs were taken out.

General. So far we have dealt with definite examples of the application of science to the poultry industry. The use of science may be a two-edged weapon, especially if applied in a partial or careless manner. As already observed, our present knowledge of the various sciences relating to poultry husbandry is far from complete, and there may be some reason for asking ourselves whether, in applying our partial knowledge to practice, we have not in some directions produced some undesirable results and conditions.

For example, it is sometimes said that the modern incubator has reached such a high state of efficiency that weak embryos are developed and hatched into chickens which later on become unthrifty and unprofitable. It is, however, difficult to say whether the production of these weakly chickens is due to the efficiency of the incubator or to some weakness or unsatisfactory condition in the breeding stock that produced the eggs. It may have been that the application of our knowledge—incomplete as it is—of the mode of inheritance of a particular economic quality, such as egg yield, has been unwisely applied in the production of the breeding stock and has thus produced—perhaps cumulatively through several generations—some physical or physiological weakness in the birds themselves. It may be that our increase in knowledge of the nutritive requirements of the fowl, and of the nature of the feeding stuffs needed to give rapid growth and early maturity, have been applied without sufficient knowledge of the ultimate effect on the constitution of the birds and of their progeny. Although these and similar undesirable results may perhaps have been brought about by the application of incomplete knowledge, it illustrates not only the possible dangers of such procedure, but also the urgent necessity for a further increase in our knowledge.

The concrete examples already given regarding the applications of science relate to only a small part of the poultry research and investigation that has been done and is still going on in many parts of the world. If we may now give a little play to our imagination, it may be interesting to

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consider some of the possible effects on the future practice of poultry husbandry which the present investigations of the research worker may perhaps achieve. As previously stated, the increase in the rate of mortality amongst poultry constitutes one of the most important and urgent problems requiring solution. This problem is very complex in character. Birds may die from specific diseases, or from physical breakdown of various kinds. To what extent are deaths from these causes preventible? To what extent are they brought about by errors in breeding, feeding and management? There may be errors the adverse effects of which on the birds may not have been strongly visible for one or more bird generations, but may have been cumulative, until in some succeeding generation the damage done expresses itself in an outbreak of disease or an alarmingly high rate of mortality from what seem to be obscure causes.

Much investigation has been done, and much is still going on, into the influence on the nutrition of the bird of the so-called accessory food substances, vitamins and minerals; and already, much of the knowledge gained is reflected in the composition of poultry rations in common use to-day; but our knowledge of vitamins and their influence is still incomplete, and the part played by the various mineral substances in the metabolism of the hen is by no means fully known. As regards poultry rations it has been found that a deficiency of the known vitamins and of certain mineral substances, or an excess of the latter, will cause definite forms of disease or physical breakdown, but it may be that, before long, our knowledge of the relationship between nutrition and certain diseases will so improve that it will be possible to exercise a much greater measure of prevention of or control over outbreaks of these diseases than is possible at present.

Much has been done to improve existing methods and to determine new means of producing in fowls immunization against certain diseases. Already certain vaccines mentioned above are in common use. The disease known as fowl paralysis, which has caused heavy ravages in this country, is at present undergoing investigation in several countries. So far, even the means and conditions of its transmission are not known, but it may be that before long this disease, too, may yield its secrets to the patience and perseverance of the research worker. It is not only through an improvement in our knowledge of therapeutics, the application of vaccines,

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etc., that our control over disease may be improved; it may be that the geneticists may in time be able to assist the poultry-keeper in producing strains of birds with a high degree of natural resistance against certain diseases. In this field, some very suggestive investigations are being conducted at Edinburgh by Dr. Greenwood, who is also examining the possibilities of breeding birds that will produce eggs at an economic level over a period of from three to four years, and also non-moulting birds that will produce continuously over a two-year period. The possibilities of new scientific discoveries of this kind are attractive.

In the meantime, the poultry-keeper should feel grateful for the help that science has already given him. He should do what he can to support and encourage research workers who spend their lives in activities that must of necessity often prove disappointing in their results. Above all, the poultry-keeper should be ready for the reception of new ideas, although in practice economic reasons may compel him to be somewhat conservative in putting them into operation. It is fortunate for him, however, that there are now so many State-aided institutions at which new ideas and new discoveries can be tested on a commercial scale, and so save both the time and money of the individual poultry-keeper in making these tests for himself.

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EIGHTEENTH-CENTURY CROP HUSBANDRY IN SOMERSET AND WILTSHIRE

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Somerset was always devoted to grazing, although the rich soil of the Vale of Taunton made it flourish with cereals and orchards. It was, indeed, said by the numerous contemporary topographers to be "good for the abider but bad for the rider," and Young, when he came to visit the district, emphatically agreed that the roads were bad. Defoe tells us that the whole district between Bridgwater and Bristol was a rich grazing country, and mentions the Cheddar cheese.¹

Almost the earliest definite fact we learn about the county is that Red Clover or Marl grass was much grown, the wild seed having been collected and propagated by Farmer James of Chilcompton near Wells, by whom it was reputed to last from fifteen to twenty years, but only on a soil where blue marl is.² At Watchet on the coast there was a lime-burning industry both for manure and for cement in 1768. Both the clover and the lime burning show that Somerset farmers were up-to-date in the eighteenth-century.³

Young visited the county in 1771, and all the country from Chard to Taunton and Bridgwater was then thickly inclosed. At Henlade, the course of cropping was clover, wheat, barley and clover, wheat, wheat, barley, etc. A compost was used of headland soil and dung, and dung and lime. Corn was dear, but none of the pasture was being broken up. Mixed teams of horses and oxen were used. There were many orchards in the district. At Halfwell there were similar long courses, but Sedgmoor was a waste of 11,500 acres, the Quantocks were dreary hills, and Hunsfield Moors were also waste. At Compton a rotation of fallow, wheat, barley, oats was used. This was a bad system and was practised where the farms were under no restraint of cropping, such as might have been placed upon an open field-farm. The land was held in "several" and there was no excuse for this rotation. Young was horrified by its worthlessness and does not hesitate to condemn it. Twelve corn crops were, indeed, sometimes taken in succession. There was an improvable common at Stone Easton.⁴

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Near Bridgwater things were much better; the Norfolk course had been adopted by 1795, lime was freely applied, and oxen were used for ploughing, but the drainage of Sedgmoor had not led to any greater improvement than inclosure in 1797, although the rich district was estimated by Young as thirty miles long by ten miles wide.⁵ Many of the farms were in the hands of occupier-owners, and were not large, seldom exceeding an annual value of £200 a year, although at West Camel there were large farms running up to £1,000 rent, and on these there was an improved system.⁶ In this district, flax and hemp were grown in great abundance, and turnips on a large scale, fallowing being given up at the end of the century.

On the Mendips, a good deal of lime was used, but the tillage was said to be very defective, there being few turnips, while fallowing was general. Little barley was grown, but teasles for the wool manufacturers made a paying crop. Potatoes had become general, although uncommon thirty or forty years before. The whole district was full of orchards, paring and burning had been given up, and marl was used in some parishes.

In the south-east of the county, turnips were general and the upland was used for tillage, the lowland for grazing. Drilling had only been tried by two farmers, and the courses and manuring had not been changed.⁷ Perhaps this was not so foolish as it may seem, because Maton, who may, of course, be relating a traveller's tale, tells us that 35 bushels of wheat per acre had been harvested on the moors for eighteen years in succession.⁸ The ploughs of the county were strong, some having one wheel and some a foot only; the mouldboard was, however, usually too long; the harrow was quite ordinary; there were no threshing machines; but the waggons were small, compact and well-made.⁹

Wiltshire. The large extent of Salisbury Plain, in the heart of the county, provided sheep walk and a measure of alternate husbandry, but the general farming of the county to the north and south of the Plain did not change very much during the century.¹⁰ Such improvements as had been made were slight, and some of them must be allocated to a period before 1700. Land was limed here in Lisle's day (c. 1700). One farmer of the county tried to persuade him to keep an

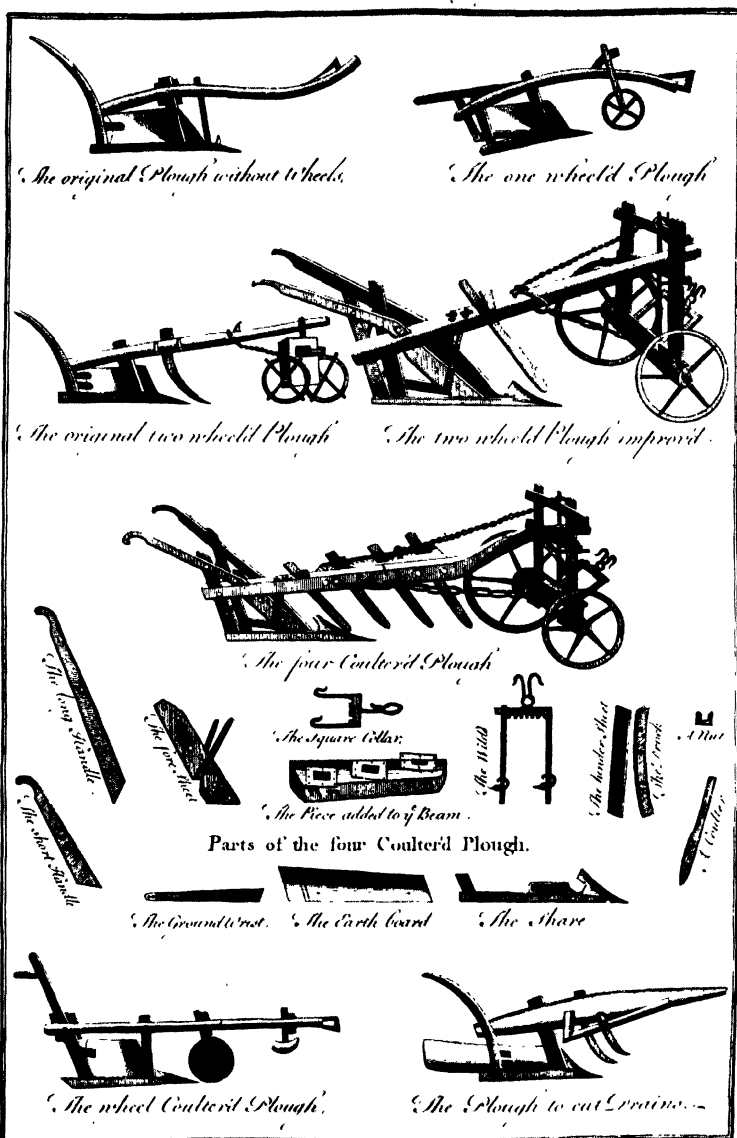
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ox-team with his horse-plough, because they would be able to summer fallow the strongest lands in dry weather if harnessed ten to a plough. Another farmer, living at Puck Shipton, had broken up grass land and sown oats, great wheat and red wheat, so that the land was tamed. Broad clover was sown with black or white oats in preference to barley, provided the ground worked up mellow. At Holt they did not roll, but sowed their wheat in round furrows 4 in. deep, and after reaping they stooked their wheat in such manner that it might be left out a month. At Colne they ploughed-in broad clover the second year, rolled it or trod it in with sheep, and sowed wheat.¹¹

Early in the century a great deal of the downland had been ploughed for wheat by means of the sheep-fold as a preparation, but the lower parts, as in the adjoining parts of Gloucester, were occupied in large dairy and grazing farms.¹² The improved or rath-ripe barley sowed in Oxford and neighbouring counties was an achievement in eighteenth-century plant-breeding, which had its origin in this county, but fresh seed had to be obtained from the local producers as it did not retain its early ripening character when continuously sown in the other counties.¹³ Hale could, however, pass the remark in 1756 that the noted starving parts of Wiltshire and Hampshire could be made like Buckingham and Hertford by inclosure.¹⁴ Sainfoin was an established crop in the county and was said to have been introduced about 1660.¹⁵

Young found the farms between Devizes and Salisbury very large—from 600 to 800 acres of arable and down in addition. Three or four ~~horses~~ were used in a plough and were barely able to achieve the standard acre a day. The course was the old three-field system of wheat, barley, fallow, but he says there were many turnips. Hogs, he says, were fed on whey, grains, etc., for the famous bacon, but Mordant says they were, like the sheep on turnips, staked out in the clover. Some paring and burning was done, and Young regrets the pasture on the Plain, which would make fine tillage.¹⁶ All the open field in the north of the county was still under a system of two or three white crops and fallow, but most of this part was devoted to dairies and sheep.

Between Marlborough and Hungerford there were watered meadows, and here some of the land was under improved courses in 1771.¹⁷ Between Savernake and Hungerford, indeed, the Rev. Richard Warner says that land soon



Engraved for The Compleat Body of Husbandry. Printing by the Kings authority in Weekly Numbers at 6 each.

This engraving shows generally the types of plough used in the middle of the eighteenth century. It has been chosen to illustrate this essay, because the writer is not acquainted with any contemporary drawing which shows the ploughs used in the counties discussed.

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degenerates (from picturesque wilderness) into open corn-field, but near the town it recovered a little spirit. He was, perhaps, the earliest writer to think cornland a degeneration.¹⁸ Both issues of the report were written by Thomas Davis, and, with few exceptions, the crops and rotations were the same when he wrote as they were in the early part of the century.

In the south-east of the county, some of the open-field farmers had agreed to sow clover and rye grass in place of the fallow, and some had even gone so far as to lay out four fields for the purpose. Oats were not much cultivated here, and few beans or peas, barley being the favourite crop. There were few turnips, but a good deal of rape was grown on the downs, while rye was grown for sheep feed and potatoes had become popular.

In the inclosures, some farmers had adopted the Norfolk course; some, however, fallowed two years for wheat on the downs. The sheep-fold was the general manure, little farm-yard dung being used. Peat was used at Pewsey, the red lands were chalked, and some marl was used on the strong lands. Paring and burning was still used, and in the "Cotswolds" part, the rotation was wheat, oats, turnips, barley, clover mown, clover fed and a summer fallow.¹⁹

In addition to the large farms mentioned by Young, the Reporter tells us that there were many small farms held on customary tenure, and the rentals of these ranged between £18 and £40 a year, a few rising as high as £50; some consolidation was taking place at the end of the century and some Scottish farmers had come to the county in 1813, being given twenty-one year leases, because they had the reputation of being better farmers than the natives.²⁰

Two kinds of ploughs were used. On the hills a two-wheel, and a one-wheel which could also be used as a foot-plough if the wheel were taken off. The old harrows were still in use in 1813. Waggons were only used for hay and corn, but both carts and waggons were heavy and clumsy. A nine-share plough (really a cultivator) and a drag harrow were used for preparing the seed-bed on light down land.²¹

¹ *Tour*, 1724, II, Letter I, pp. 27, 38.

² Richard North: *An Account of the Different Kind of Grasses*, 1759, p. 4.

³ *Rural Elegance Display'd*, 1768, p. 277.

⁴ *Eastern Tour*, 1771, III, pp. 392-419; IV, pp. 4-22.

⁵ *Annals*, XXIII (1795), pp. 417, 418; XXIX (1797), pp. 304-5, 315-6.

⁶ A. Billingsley: *Somerset*, 1798, pp. 31, 34, 269; *Annals*, XXVIII, p. 48.

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- ⁸ Wm. George Maton: *op. cit.*, p. 116.
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- ¹⁰ Ernle: *English Farming Past and Present*, p. 233-4.
- ¹¹ *Observations* . . . 1757, I, pp. 73, 136, 167 ff, 210, 227, 332; II, p. 49.
- ¹² Defoe: *Tour*, 1724, II, Letter I, p. 45 ff, 49; *ibid.*, 1753, I, p. 249; II, pp. 39, 40, 44-5.
- R. Bradley: *General Treatise*, 1726, p. 32.
- John Laurence: *New System*, 1726, p. 68.
- See also Ellis: *Modern Husbandry*, 1750, II (March), p. 77; William Toldervy: *England and Wales Described*, 1762, p. 68.
- ¹³ Laurence: *ibid.*, p. 96.
- ¹⁴ *Compleat Body*, 1756, p. 100.
- ¹⁵ *Museum Rusticum*, I (1768), p. 463.
- ¹⁶ *Six Weeks' Tour*, 1768, pp. 153-167.
- Mordant: *Complete Steward*, 1761, p. 151.
- ¹⁷ Young: *Eastern Tour*, 1771, IV, pp. 26-33; *Annals*, VIII (1787), pp. 55-81.
- ¹⁸ *Observations on the River Wye* . . . in . . . 1770, 1782, p. 96.
- ¹⁹ *Report*, 1794, pp. 43-65, 91, 128-9; *Annals*, XXVI (1794), p. 369; XXVIII (1796), pp. 354-5, 359-63, 460-462; XXX (1798), p. 80.
- Marshall: *Southern Counties*, II, pp. 319-331.
- Report*, 1813, pp. 55-71, 105-6, 110-111, 114.
- ²⁰ *Report*, 1794, p. 14; *ibid.*, 1813, pp. 15, 171-2.
- ²¹ *Report*, 1813, pp. 35-37, 52-53.

LIVE STOCK IMPROVEMENT SCHEME: REPORT FOR THE YEAR ENDED MARCH 31, 1936

THERE has been little change during the year under review in the operation of the Live Stock Improvement Scheme. The location of premium bulls has continued to be somewhat adversely affected by the increased attention now being paid to milk production as compared with stock-rearing. The demand for premium boars has, however, been maintained, as the need for good boars for the production of the right type of bacon for present market requirements is widely recognized. The trade for heavy horses has continued good, with the result that still further increases have been shown in the numbers of stallions travelled by Societies with the aid of grants from the Ministry.

There has now been sufficient time for the provisions of the Improvement of Live Stock (Licensing of Bulls) Act, 1931, which came into force in England and Wales on August 1, 1934, to become well known to farmers, and from the number of applications for licences that are received by the Ministry it is clear that there is very little attempt at evasion of the Act.

There is little doubt that the great majority of stock-breeders in England and Wales are now satisfied that the licensing of bulls is in every respect a useful measure, and that in the course of time it will result in a marked improvement in the general standard of cattle in the country.

Premium Bulls. The fixed price for milk and the unsatisfactory price of beef have resulted in a continuance of the increased attention to dairying, to which reference was made in the report on the Scheme for the year 1934-35. This tendency has caused farmers to attach more importance to breeding for milk production, and less consideration has been given to the type of animals bred. Indiscriminate crossing by the use of bulls of purely dairy breeds, without regard to the breed of the cows, has continued, and this is likely to have a serious effect in the near future. Owing to the use of these bulls the standard of stores for feeding has already deteriorated to some extent, and there is a shortage of good type stores. In the circumstances, it is satisfactory to be able to record that there are still some farmers who refuse to introduce dairy sires into herds with a beef tradition. The

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trade in store cattle has shown some improvement, and the higher prices farmers have had to pay for dairy cows of milking quality to replenish their herds should increase the interest in the rearing of good-class cattle.

Other factors adversely affecting the distribution of premium bulls under the Scheme are:—

(1) More farmers are keeping their own bulls owing to the increase in the size of their herds and the difficulty of driving cows for service, due to present day road traffic.

(2) A tendency on the part of some farmers to think that any bull that may have been licensed is good enough to bring about an immediate improvement in their stock, regardless of the fact that the standard for licensing purposes cannot approach that required for a premium bull. In one village, where there was a bull Society, nine bulls sired by the premium bull, but belonging to different owners, were licensed. The Society then lapsed through lack of support.

(3) Initial outlay involved in the purchase of a premium bull.

Despite these difficulties, there is evidence of good work performed by premium bulls in improving the quality of the cattle. In many instances where premium bulls have been used for some time, the herds of the custodians of the bulls are object lessons of what can be achieved by the use of good-class sires. A custodian of a Midland Bull Society, whose herd has been built up by means of premium bulls, won the second prize in a Milk Recording Society's Large Herd Competition for the second successive year.

The number of premium bulls at the end of March, 1936, was 1,469, a decrease of 7 on the previous year.

TABLE I.—NUMBER OF BULLS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME

<i>Year</i> (April 1—March 31)	<i>No. of</i> <i>Bulls</i>	<i>Year</i> (April 1—March 31)	<i>No. of</i> <i>Bulls</i>
1914-15 ..	497	1925-26 ..	1,175
1915-16 ..	633	1926-27 ..	1,287
1916-17 ..	659	1927-28 ..	1,372
1917-18 ..	710	1928-29 ..	1,408
1918-19 ..	721	1929-30 ..	1,476
1919-20 ..	675	1930-31 ..	1,537
1920-21 ..	668	1931-32 ..	1,494
1921-22 ..	847	1932-33 ..	1,452
1922-23 ..	947	1933-34 ..	1,469
1923-24 ..	978	1934-35 ..	1,476
1924-25 ..	1,069	1935-36 ..	1,469

The total number of cows served during the year was 96,827, belonging to 22,634 owners, compared with 94,728 cows belonging to 22,781 owners in the previous year. The average number of services per bull was 67. The average

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numbers of persons sending cows to each bull was 16; 14 in England and 19 in Wales. The average number of cows sent by each owner was a little over four.

The standard of premium bulls has been fairly well maintained, and in some districts there is a keen demand for bulls that have completed their period under the Scheme. In one district in Wales efforts are being made through the local branches of the National Farmers' Union to supply farmers with lists of such bulls, and in this district the demand far exceeds the supply.

During the year under review the Shropshire Live Stock Improvement Association was formed to stimulate the improvement of live stock in the county by impressing upon farmers the importance of using the sires subsidized under the Ministry's Scheme. It held its first show of the progeny of premium sires in Shropshire at Shrewsbury in May, 1936, and there were over 100 individual exhibitors and over 300 entries. A scheme for the marking of the progeny of premium bulls is in operation.

The Bletchley and District Live Stock Improvement Society's Scheme for the earmarking of calves got by premium bulls continues to make progress, the number of animals marked during the year showing an increase of 180 over the previous year's number. Steady progress has also been made in the schemes in Staffordshire, but the Warwickshire scheme has lapsed.

The Welsh Dragon Mark Association was formed in 1931 as the Brecon, Radnor and Monmouth Welsh Dragon Mark Cattle Association, and comprised the members of premium bull societies in those counties. The progeny of premium bulls were tattooed with the Association's mark, and steps were taken to establish direct contact between the members and purchasers of store cattle in the Midlands. The success of the scheme led to its being taken over by the Welsh Agricultural Organization Society, under whose ægis the scheme continues to flourish. The success of the spring and autumn sales in the Brecon, Radnor and Monmouth districts has been distinctly encouraging. Efforts have been made to extend the scheme to other parts of Wales, but the exceptionally low prices obtained for store cattle have militated against its extension. The Welsh Black Cattle Society approved the scheme in principle, but considered the time inopportune to undertake a similar organization for their breed.

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Premium bulls and their progeny continue to do well at shows and sales. One premium Hereford bull was sold for export to the Argentine for 150 guineas, whilst another and his son sold for 120 guineas and 48 guineas respectively. Twelve bulls sired by a premium bull in 1934 and 1935 averaged 45 guineas each at Penrith. The progeny of a premium bull located in Wales won the first prize and challenge cup at the Southern, Midland and Welsh Shorthorn Breeders Association's Show and Sale at Birmingham for the second year in succession, whilst an eleven-month-old dairy bull, sired by a premium bull, won a second prize at the Show and sold for 70 guineas.

A premium Shorthorn bull was first in its class and reserve male champion at the Royal Show, and a South Devon bull, which had been located under the Scheme for three years, won the championship of its breed. A Devon bull won two firsts and a second at the Devon County Show, a third at the Bath and West, and three firsts and a championship at the Royal Cornwall Show. The champion Shorthorn bull at the Royal Welsh Show was a premium bull.

Breeds and Prices. Table II gives the number and average prices of each breed located in the last three years. It will be seen that the average price of subsidized bulls is slightly less than last year.

TABLE II.—NUMBER AND AVERAGE PRICES OF PREMIUM BULLS.

BREED	1933-34			1934-35			1935-36					
	No.	Average price			No.	Average price			No.	Average price		
		£	s.	d.		£	s.	d.		£	s.	d.
Aberdeen Angus ..	6	39	12	0	7	36	9	10	5	39	5	5
British Friesian ..	3	50	1	8	5	49	3	2	6	49	6	0
Devon	194	47	6	7	200	46	17	4	202	46	7	3
Galloway	3	27	6	0	3	27	6	0	3	27	6	0
Guernsey	28	37	8	5	31	39	4	7	29	39	2	10
Hereford	214	40	4	5	213	39	7	3	218	39	15	5
Lincoln Red Short-horn	152	39	1	2	157	39	1	5	157	39	4	7
Red Poll	2	38	7	0	1	36	15	0	1	31	10	0
Shorthorn	773	41	18	0	759	41	4	9	750	40	12	2
South Devon ..	13	43	15	0	15	42	15	3	14	40	4	5
Sussex	8	34	14	3	9	34	8	5	7	31	14	5
Welsh Black ..	73	27	18	6	76	27	19	4	77	27	2	11
All Breeds ..	1,469	41	5	1	1,476	40	14	5	1,469	40	6	11

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There is little change in the relative numbers of the different breeds to be recorded in 1935-36. Shorthorns account for more than half of the premium bulls, but are 9 fewer than last year. The number of dairy Shorthorns increased from 504 in 1934-35 to 536, but beef and dual-purpose Shorthorns decreased from 171 and 84, to 141 and 73 respectively. In considering the number of bulls of different breeds in respect of which grants are made, it should be remembered that the choice of breed of bull is a matter left to the Society, but normally the Ministry requires to be satisfied that most of the cows that will be brought to the bull for service are of the same breed or type as the bull. The reason for this is that it is only by grading up within the breed that progressive improvement can be secured by the successive use of good bulls.

Service Fees. The service fees charged for the use of premium bulls during the past three years have been as follows:—

SERVICE FEES—BULLS.										
<i>Year</i>	2/6	3/-	3/6	3/9	4/-	4/6	5/-	5/6	6/-	
1933-34 ..	79	52	56	1	147	14	865	9	109	
1934-35 ..	95	48	61	1	173	20	833	9	108	
1935-36 ..	93	57	60	1	179	21	831	8	99	
<i>Year</i>	...	6/6	7/-	7/6	8/-	8/6	9/-	9/6	10/-	10/6
1933-34 ...	14	3	106	5	—	—	—	—	9	—
1934-35 ...	11	5	103	4	—	—	—	—	5	—
1935-36 ...	11	4	100	2	—	—	—	—	2	1

Service fees continue to show a lower tendency, although 5s. remains the popular charge. The number of fees above 5s. have declined from 245 in 1934-35 to 227, whilst those under 5s. have increased from 398 to 411.

Premium Boars. It is evident that the Pig Marketing Scheme is having a good effect on pig-breeding in general. Reports from the Ministry's Live Stock Officers show that greater care is being taken in selecting breeding stock with the object of providing the correct type of pig to meet the requirements of the bacon factory, and it is now more generally realized that the choice of the boar is an important factor. More attention is also being paid to scientific feeding, and, where careful breeding and feeding have been practised, prices have not been unremunerative.

The Ministry continues to receive reports of improvement in the quality of pigs in districts where premium boars have

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been located for some years. Satisfactory prices have generally been realized for the progeny of premium boars, and they have usually graded well when run to bacon weights. It is reported that in one district a large dealer buys nearly all the pigs sired by premium boars and pays about 2s 6d. a head above the average market price for them. All these pigs are sold by him to feeders.

There is a tendency for farmers to increase the number of sows they keep, and to retain a boar of their own rather than make use of the premium boar. At the same time it is reported in some districts that cottagers and labourers who have been in the habit of keeping one or two sows have been discouraged by the low prices obtained for young pigs and have given up breeding. This also has affected the use of premium boars, with the result that the number of boars located under the Scheme on March 31, 1936, was 1,029, a reduction of three on the previous year.

TABLE III.—NUMBER OF BOARS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME.

<i>Year</i> (April 1—March 31)	<i>No. of</i> <i>Boars</i>	<i>Year</i> (April 1—March 31)	<i>No. of</i> <i>Boars</i>
1914-15 ..	115	1925-26 ..	710
1915-16 ..	193	1926-27 ..	844
1916-17 ..	216	1927-28 ..	907
1917-18 ..	264	1928-29 ..	933
1918-19 ..	350	1929-30 ..	972
1919-20 ..	399	1930-31 ..	1,047
1920-21 ..	441	1931-32 ..	1,024
1921-22 ..	550	1932-33 ..	973
1922-23 ..	569	1933-34 ..	1,007
1923-24 ..	638	1934-35 ..	1,032
1924-25 ..	655	1935-36 ..	1,029

The average number of services per boar in service years expiring in 1935-36 was 65. The total number of sows served was 65,699, belonging to 25,178 persons.

Breeds and Prices. Table IV gives the number and average prices of each breed in the last three years. This shows that the average price for the Large White, which comprises the vast majority of the subsidized boars, decreased by 1s. to £10 18s.

Large Whites showed no diminution in popularity from the high position reached in the previous year. Welsh Boars increased from 24 to 33, principally at the expense of the Long White Lop-eared; the number of Welsh Boars located in Wales was 32 against 23 in the previous year, whilst during the same period the number of Long White Lop-eared

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TABLE IV.—NUMBER AND AVERAGE PRICES OF BOARS OF EACH BREED.

BREED	1933-34			1934-35			1935-36					
	No.	Average price			No.	Average price			No.	Average price		
		£	s.	d.		£	s.	d.		£	s.	d.
Berkshire	6	9	1	6	2	13	13	0	1	15	15	0
Cumberland	11	9	4	5	2	8	14	0	2	7	7	3
Essex	2	9	9	0	1	10	10	0	1	8	0	0
Gloucester Old Spots	1	10	10	0	—	—	—	—	—	—	—	—
Large Black	8	12	1	3	5	11	9	2	3	10	6	8
Large White	915	10	8	11	969	10	19	0	970	10	18	0
Lincoln Curly Coated	5	6	10	10	—	—	—	—	—	—	—	—
Long White Lop-eared	16	11	18	6	16	11	13	11	10	10	13	7
Middle White	21	9	9	1	11	9	4	6	8	10	7	8
Wessex Saddle-back	2	8	18	6	2	11	11	0	1	13	13	0
Welsh	20	11	16	8	24	11	13	5	33	11	8	10
All Breeds	1,007	10	8	10	1,032	10	19	3	1,029	10	18	2

decreased in Wales from 12 to 7. There were 185 Large Whites in Wales in 1935-36, as against 188 in the previous year.

Service Fees. The following table shows the service fees charged during the last three years:—

SERVICE FEES—BOARS							
<i>Year</i>	2/6	3/-	3/6	4/-	4/6	5/-	5/6
1933-34 ..	4	11	18	92	6	743	2
1934-35 ..	2	11	21	99	7	763	2
1935-36 ..	4	13	23	97	6	772	2
<i>Year</i>	6/-	6/6	7/-	7/6	8/-	10/-	
1933-34 ..	70	3	2	53	—	3	
1934-35 ..	71	2	1	50	1	2	
1935-36 ..	61	1	2	46	1	1	

There is little change to record, but the gradual tendency towards lower service fees continues. The service fee for about 75 per cent. of the boars is 5s., while for 14 per cent. the charge is less than 5s., and only in the remaining 11 per cent. is more than 5s. charged.

Premium Rams. Thirty grants for Welsh Mountain Rams were available for the 1935 season, all of which were utilized. Originated as an experimental measure in North Wales in order to encourage the breeding of an approved type of Welsh Mountain Sheep, it has now been extended throughout

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Wales; in fact, two-thirds of the premium rams are now located in the uplands of South Wales. The hiring fees ranged from £6 to £12, with service fees from 1s. to 3s. per ewe. Twenty-five of the rams were hired at £10 or over. During the season, 1,804 ewes were sent for service under the scheme, an average of 60 ewes per ram. Progress under this section of the Live Stock Improvement Scheme is very marked, owing to the fact that the ewes as well as the rams must conform to type and are subject to approval by the Live Stock Officer.

Horse Breeding : Heavy-Horse Grants. Improvement in prices of young horses and geldings during the year has provided a marked stimulus to horse-breeding, and farmers who supported the Heavy-Horse Societies during the years of depression are now reaping the benefit. The improvement in the trade is reflected in the 12 per cent. increase in the number of stallions licensed under the Horse Breeding Act, 1918 (see a later section of the Report), and in the increased number of stallions subsidized under the Ministry's Live Stock Improvement Scheme. In some districts, stallions hired by societies are in opposition to privately-owned stallions travelling at lower fees, and the support accorded to the societies in the face of such competition is evidence that the provision of good-class sires is appreciated by the members. In this connexion it is interesting to note that :

(1) The champion stallion at the Shire Horse Show, 1936, was hired by a Hereford society ;

(2) two Clydesdale stallions hired by northern societies changed hands for 1,600 and 1,200 guineas respectively in the spring ; and

(3) the Suffolk stallion that was the champion at the Ipswich Show and reserve champion at the Royal Show was hired by a society in Suffolk.

Each of these societies operated under the Ministry's Scheme.

The progeny of premium stallions have made good prices at the sales. A colt and a filly sired by a Yorkshire society's horse sold for 100 guineas each, geldings sired by premium stallions sold at Carlisle for £80 and £90, whilst at the Autumn Foal Show and Sale at Crewe, 10 foals by a premium stallion sold at an average price of 47 guineas, a colt foal selling for 105 guineas and a filly foal for 60 guineas.

The show record of the progeny of one premium stallion that has travelled for six years under the Ministry's Scheme

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is deserving of note. At the 1936 Shire Horse Show its progeny obtained the following prizes:—

First and supreme champion stallion; first and junior champion stallion; 3rd and 6th prizes yearling colt class and 6th prize in yearling filly class.

In addition, its progeny also won numerous prizes at the Warwick County and other shows. Another premium stallion sired last year's female champion and this year's first prize two-year-old filly at the London Show.

TABLE V.—HEAVY-HORSE SCHEME

<i>Service Season</i>	<i>No. of Stallions</i>	<i>Total No. of Mares served</i>	<i>Average No. of Mares served</i>	<i>No. of Assisted Nominations</i>	<i>Average Hiring Fee of Stallions</i>	<i>Average Service Fee</i>	<i>£ s. d.</i>
1914	.. 72	6,365	68	1,503	231	£ 2	8 6
1915	.. 97	9,122	94	2,430	241	2	9 6
1916	.. 108	9,995	92	2,181	244	2	11 0
1917	.. 110	10,556	96	2,151	258	2	16 3
1918	.. 122	12,281	100	2,165	285	2	15 8
1919	.. 118	10,920	96	1,996	317	3	6 3
1920	.. 105	9,133	87	1,839	345	3	13 1
1921	.. 101	7,888	78	1,943	333	3	13 7
1924	.. 87	6,098	70	*	178	2	7 0
1925	.. 96	7,413	77	1,723	194	2	8 4
1926	.. 98	8,165	83	2,171	208	2	8 6
1927	.. 105	8,950	85	2,599	211	2	8 9
1928	.. 114	9,792	86	2,805	217	2	9 4
1929	.. 120	10,196	85	3,052	221	2	9 9
1930	.. 140	12,248	87	3,604	239	2	11 1
1931	.. 159	14,226	89	4,266	235	2	10 2
1932	.. 162	14,624	90	3,945	226	2	9 9
1933	.. 165	15,655	95	4,280	220	2	10 8
1934	.. 170	16,071	95	4,353	221	2	10 6
1935	.. 185	17,548	95	4,710	231	2	10 8

The figures in Table V do not include those relating to the Cumberland and Westmorland Heavy Horse Breeding Society, which issues assisted nominations to selected stallions travelled by their owners in Cumberland and Westmorland. The figures for this Society are:—

<i>Service Season</i>	<i>No. of Assisted Nominations</i>	<i>Service Season</i>	<i>No. of Assisted Nominations</i>
1915	.. 385	1927	.. 247
1916	.. 394	1928	.. 281
1917	.. 328	1929	.. 283
1918	.. 321	1930	.. 269
1919	.. 264	1931	.. 290
1920	.. 254	1932	.. 198
1921	.. 255	1933	.. 217
1924	.. 121	1934	.. 209
1925	.. 197	1935	.. 208
1926	.. 220		

* No grant was made by the Ministry for assisted nominations (except to the Cumberland and Westmorland Society) for the service season 1924.

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The average hiring fee of the stallions subsidized was £10 higher than in the previous year, and grants were paid in respect of 15 more stallions.

The number of assisted nominations issued was 4,918, an increase of 356 over that in 1934-35, and as the regulations permit of the award of only one assisted nomination to a mare owner, it will be seen that the smaller farmer is sharing in the prosperity of this branch of agriculture. The average service fee shows no appreciable change, whilst the average number of mares served per stallion was the same as in the previous year. The total number of mares served, including those of the Cumberland and Westmorland Society, amounted to 17,756, which is the highest number reached under the Scheme since its inception, and shows an increase of nearly 1,500 compared with 1935. There were 144 Shire, 22 Clydesdale and 19 Suffolk stallions travelled under the Scheme in 1935, as compared with 132 Shire, 22 Clydesdale and 16 Suffolk stallions in 1934.

The number of foals produced by stallions subsidized in 1934 was 9,259, which indicates that 58.5 per cent. of the services were fertile. This compares with 8,769 foals and 58.3 per cent. in the previous year. The average foaling percentages of stallions of the three breeds used under the Scheme was Shire 58.6, Clydesdale 52.4, and Suffolk 68.1.

Licensing of Stallions. The steady increase which has been noticeable in the last few years in the number of stallions licensed under the Horse Breeding Act, 1918,

TABLE VI.—LICENSING OF STALLIONS

<i>Year (ending October 31)</i>		<i>No. of Applications for Licences</i>	<i>No. of Licences issued</i>	<i>No. of Refusals</i>
1920	.. ..	4,153	3,749	404
1921	.. ..	4,060	3,816	244
1922	.. ..	3,644	3,479	165
1923	.. ..	2,897	2,761	136
1924	.. ..	2,285	2,210	75
1925	.. ..	1,908	1,849	59
1926	.. ..	1,664	1,608	56
1927	.. ..	1,574	1,537	37
1928	.. ..	1,454	1,414	40
1929	.. ..	1,472	1,436	36
1930	.. ..	1,472	1,430	42
1931	1,470	1,432	38
1932	1,522	1,477	45
1933	1,556	1,516	40
1934	1,732	1,687	45
1935	1,945	1,893	52

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continued in 1935; the total number of licences issued in England and Wales was 1,893, an increase of 206, or 12 per cent., on the previous year; as compared with 1931 the increase amounts to as much as 32 per cent. Licences were refused in respect of 52 stallions, an increase of 7 as compared with 1934. Of the rejected stallions, 48 were of heavy breeds and 4 of light breeds.

Numerically the greatest increase in heavy stallions was shown by Shires, in respect of which 1,074 licences were

TABLE VII.—NUMBERS OF LICENCES GRANTED UNDER THE HORSE BREEDING ACT, 1918, IN ENGLAND AND WALES, 1934 AND 1935

BREED OR TYPL	Pedigree (i.e., Stallions entered or accepted for entry in the recognized Stud Book of their Breed)		Non-Pedigree (i.e., Stallions not entered or accepted for entry in a recognized Stud Book)		Totals of each Breed and Type (Pedi- gree and Non-Pedigree)	
	1934	1935	1934	1935	1934	1935
HEAVY						
Shire	837	922	125	152	962	1,074
Clydesdale	138	153	25	31	163	184
Suffolk	176	202	6	8	182	210
Percheron	67	76	4	4	71	80
Others	—	—	55	68	55	68
Total Heavy Horses	1,218	1,353	215	263	1,433	1,616
LIGHT						
Hackney	11	11	5	6	16	17
Thoroughbred	140	161	3	2	143	163
Arab	9	8	3	2	12	10
Others	7	5	3	8	10	13
Total Light Horses	167	185	14	18	181	203
PONIES AND COBS						
Welsh	8	8	1	1	9	9
Fell	9	7	1	2	10	9
Dales	9	10	6	5	15	15
Polo and Riding	10	8	1	2	11	10
Welsh Cob	17	17	8	11	25	28
Others	3	3	—	—	3	3
Total Ponies and Cobs	56	53	17	21	73	74
TOTALS ..	1,441	1,591	246	302	1,687	1,893

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issued; this is 112 more than in 1934, or an increase of nearly 12 per cent. Relatively larger increases, however, were shown by other heavy horses, Suffolks rising from 182 in 1934 to 210 in 1935 (15 per cent.), Clydesdales from 163 to 184 (13 per cent.) and Percherons from 71 to 80 (13 per cent.). The number of light stallions licensed was 203, and the increase of 22 over the 1934 figure is mainly attributable to the greater number of thoroughbreds licensed.

The number of stallions rejected for each of the prescribed diseases and defects was as follows:—

Whistling	5	Bone Spavin	4
Roaring	12	Stringhalt	2
Sidebone	15	Defective Genital Organs ..	1
Cataract	6	Poor Conformation and	
Ringbone	5	Physique	2

Fourteen appeals were lodged against the Ministry's decision to refuse to grant licences, as compared with 7 in the previous year, and 9 of them were successful.

The number of infringements of the Act reported to the Ministry during the season was 47, an increase of 21 on the number reported in the preceding season. Most of the infringements reported were in respect of the travelling or exhibition for service of licensed stallions unaccompanied by their licences, and the owners and leaders were warned by the Ministry or police as to the requirements of the Act in this respect. In three instances, however, proceedings were taken by the police in respect of the travelling of unlicensed stallions, and convictions were obtained in two cases.

Importation of Canadian Cattle. The Ottawa Agreements Act, 1932, made it possible for Canadian cattle capable of being used for breeding to be imported into this country for purposes other than slaughter, subject to the proviso that the Minister might require any such cattle to be slaughtered within the landing place if, in his opinion, they could be used for breeding and were not suitable for that purpose. The arrangements to give effect to these provisions were embodied in the Importation of Cattle Order, 1933, which came into force on January 17, 1933.

The first cargo of cattle landed under the Order arrived at Birkenhead on January 24, 1933, and examinations of cattle that are capable of being used for breeding have been carried out at the ports of landing continuously since that date.

During the year under review, the good demand for cattle

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in the United States led to the movement of cattle from Canada to the States and there was a striking reduction in the number of Canadian cattle imported into Great Britain. During the year only 11 cargoes arrived, compared with 93 in the preceding twelve months, and the total number of cattle landed was 2,304, as against 47,850 in the previous year.

Cattle that were capable of being used for breeding numbered 616, and of these 246 were rejected as not being of sufficient merit to permit of their entry into Great Britain for breeding purposes, and were slaughtered. The cattle rejected consisted of 22 bulls, 20 cows and 204 heifers. It should, however, be borne in mind that a large proportion of the cattle sent from Canada, capable of being used for breeding, are not sent for this purpose, but are consigned for immediate slaughter.

The number of steers landed was 1,688 as compared with 38,526 in the previous year.

Licensing of Bulls. Particulars of the numbers of applications for bull licences dealt with during the twelve months ending March 31, 1936, are shown in Table VIII, with comparative figures for the twelve months ending July 31, 1935, which represented the first year of the operation of the Improvement of Live Stock (Licensing of Bulls) Act, 1931.

TABLE VIII.—LICENSING OF BULLS

	<i>Twelve Months ended July 31, 1935</i>	<i>Twelve Months ended March 31, 1936</i>
Applications for Licences received	28,269	38,426
Licences issued	22,607	31,969
Rejections notified	2,378	4,690
Permits issued	21	53
Licences suspended	41 (a)	32 (a)
Licences transferred	10,045	21,408
Licences expired	281	928
Appeals to referees received	95	285
Appeals to referees dealt with	89 (b)	269 (c)

(a) Licences suspended pending recovery of the bulls from temporary forms of disease (mainly ringworm).

(b) Of these 50 were decided in favour of the appellant, while in 39 cases the Ministry's decision was confirmed.

(c) Of these 138 were decided in favour of the appellant, while in 131 cases the Ministry's decision was confirmed.

It will be observed that the number of applications shows a considerable increase, and the position will soon be reached, as the older bulls die out, when practically all bulls in the country being used for service will be licensed animals. The

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leaflets that set out the requirements of the Act, and that have been circulated to all farmers with their Agricultural Returns schedule, have helped to achieve this result, but there is at the same time no doubt that the prosecutions for keeping unlicensed bulls that the Ministry has felt compelled to bring in different parts of the country have stimulated applications. There is not at present any serious tendency on the part of farmers to evade the provisions of the Act, but where evasion does occur, it is generally found among milk producers, who are content to use any bull, however poor it may be, provided it is able to achieve the purpose of bringing the cows into milk.

The Act requires applications to be submitted early enough to enable a bull to be licensed by the time it reaches the age of ten months. The applications received show that some farmers keep their bulls till they reach the age of 12 to 18 months before they apply for licences, and there is reason to believe that, in some instances, the bull has been used to serve cows before an application is submitted. Instances occur where an attempt is made to cover up the irregularity by understating the age of the bull on the application form. The Ministry is giving close attention to the possibility of evasion of the Act in this way, and farmers should realize that they are rendering themselves liable to penalties if they keep a bull without a licence after it has reached the age of ten months.

More bulls have been rejected as unsuitable for licensing during the twelve months ending March 31, 1936, the number so rejected comprising 12·8 per cent. of the total number examined, as compared with 9·5 per cent. during the twelve months ending July 31, 1935. This larger percentage is due to the somewhat higher standard required for licensing as compared with that in force when the Act first came into operation, and must not be taken as an indication that a poorer type of bull has been coming forward for inspection. On the contrary, it is clear that the operation of the Act has caused many farmers to castrate, voluntarily, young bulls ~~that they do not think~~ are good enough to be passed for licensing, ~~and there~~ is no doubt that much more care is now being taken in the selection of calves for rearing as bulls. It has been noticeable that, where a bull has been rejected as unsuitable, an animal of a much better standard has been brought forward by the owner for licensing in the following year.

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Figures showing the number licensed and rejected in each county in England and Wales are given in Table IX. It was stated last year that these figures must not be used to draw deductions as to the parts of the country in which the best class of stock is to be found, and this still holds true owing to the variations in the standard of rejection which, at present, have to be adopted on account of the different standards of the stock to be found in the various districts.

TABLE IX.—PARTICULARS OF BULLS LICENSED AND REJECTED IN EACH COUNTY IN ENGLAND AND WALES FOR THE TWELVE MONTHS ENDED MARCH 31, 1936.

County	Licensed	Rejected	County	Licensed	Rejected
ENGLAND—			Suffolk	483	167
Bedfordshire ..	130	16	Surrey	305	23
Berkshire	421	29	Sussex	790	50
Buckinghamshire ..	363	52	Warwickshire ..	434	58
Cambridgeshire ..	207	21	Westmorland ..	894	77
Cheshire	1,215	312	Wiltshire	1,016	72
Cornwall	857	39	Worcestershire ..	241	48
Cumberland	2,385	212	Yorkshire	3,503	454
Derbyshire	921	170			
Devonshire	880	69	TOTAL—ENGLAND ..	28,106	4,015
Dorset	707	52	WALES AND MONMOUTH—		
Durham	746	54	Anglesey	88	16
Essex	513	96	Brecon	221	27
Gloucestershire ..	610	76	Caernarvon	186	22
Hampshire	830	45	Cardigan	332	62
Herefordshire ..	675	52	Carmarthen	1,081	186
Hertfordshire ..	256	19	Denbigh	457	95
Huntingdonshire ..	67	9	Flint	322	51
Isle of Wight ..	163	7	Glamorgan	219	47
Kent	386	20	Merioneth	169	15
Lancashire	1,401	442	Monmouth	222	39
Leicestershire ..	494	52	Montgomery	247	59
Lincolnshire ..	883	66	Pembroke	245	34
Middlesex	27	2	Radnor	74	22
Norfolk	470	169			
Northamptonshire	330	23	TOTAL—WALES AND	MONMOUTH ..	3,863
Northumberland ..	547	72			675
Nottinghamshire ..	264	70	TOTAL—ENGLAND	AND WALES ..	31,969
Oxfordshire	367	21			4,690
Rutland	41	1			
Shropshire	769	262			
Somerset	1,448	213			
Staffordshire ..	1,067	323			

The number of permits issued remains at a low level, as the Ministry has continued its policy of requiring castration to be carried out where possible. Practically all the permits issued have been in respect of "rig" bulls which the owners desired to keep for a period for fattening purposes.

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A very considerable increase has been shown in the number of licences transferred on change of owner, but this is only in accordance with the normal course of events.

TABLE X.—PARTICULARS BY BREEDS OF BULLS LICENSED AND REJECTED

	Twelve months ended July 31, 1935		Twelve months ended March 31, 1936	
	Licensed	Rejected	Licensed	Rejected
Aberdeen Angus ..	635	38	851	57
Ayrshire	192	18	296	30
Blue Albion	37	6	44	6
British Friesian ..	1,210	95	2,010	187
Devon	720	38	1,037	77
Dexter	9	—	24	—
Dun and Belted Galloway	13	1	3	1
Galloway	258	27	272	26
Gloucestershire ..	3	—	6	1
Guernsey	969	35	1,515	60
Hereford	1,806	158	1,878	284
Highland	2	—	4	—
Jersey	328	14	478	27
Kerry	13	—	21	—
Lincoln Red Shorthorn	1,109	89	1,438	139
Longhorn	2	1	3	—
Park	18	—	16	1
Red Poll	417	44	575	108
Shorthorn	13,908	1,419	20,231	2,621
South Devon	270	6	424	21
Sussex	161	7	179	11
Welsh Black	296	18	386	22
Cross-bred	231	364	278	1,011
TOTAL	22,607	2,378	31,969	4,690

Table X shows the numbers licensed and rejected for each breed, with comparative figures for the earlier period of twelve months. These figures indicate that the increased percentage of rejections, to which reference has already been made, applied in the case of practically all breeds. For cross-bred bulls particularly, a higher standard was adopted, and this is reflected in the much greater percentage of rejected bulls of this type.

Milk Recording. Table XI shows the number of members of Milk Recording Societies in each year since 1917-18, when all Societies were required to adopt a uniform year, together with the number of herds and cows recorded.

There was a further increase in the membership of Milk

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TABLE XI.—NUMBER OF MILK RECORDING SOCIETIES

<i>Year ended</i>		<i>Societies</i>	<i>Members</i>	<i>Herds</i>	<i>Cows</i>
<i>October 1</i>					
1917-18	.. ..	27	639	708	19,793
1918-19	.. ..	38	1,191	1,332	37,880
1919-20	.. ..	46	2,075	2,312	61,323
1920-21	.. ..	52	3,328	3,664	97,903
1921-22	.. ..	55	3,949	4,362	117,023
1922-23	.. ..	55	4,365	4,767	127,151
1923-24	.. ..	52	4,764	5,209	138,086
1924-25	.. ..	50	5,081	5,516	148,905
1925-26	.. ..	49	5,174	5,656	154,322
1926-27	.. ..	51	5,166	5,650	156,847
1927-28	.. ..	50	4,862	5,320	149,971
1928-29	.. ..	50	4,616	5,065	144,812
1929-30	.. ..	49	4,501	4,934	140,266
1930-31	.. ..	49	4,412	4,836	137,866
1931-32	.. ..	49	4,267	4,682	135,912
1932-33	.. ..	49	4,187	4,598	135,902
1933-34	.. ..	49	4,211	4,622	141,325
1934-35	.. ..	49	4,264	4,696	148,426

Recording Societies and in the number of herds recorded in 1934-35, and, with the return of better conditions to agriculture, it seems possible that Milk Recording Societies may recover some of the ground lost in recent years.

Average Yield of Recorded Cows. The satisfactory supply of grass in the summer of 1935, following a fairly mild winter, coupled with the good hay available from the 1934 crop, had a beneficial effect on milk yields in 1934-35, and it is not, therefore, surprising that there was a considerable increase in the average yield of full-year cows. The average of 734 gal. is easily the highest obtained since the inception of the Scheme, being 30 gal. in excess of the average yield in 1933-34, and 15 gal. more than the previous record of 719 gal. which was obtained in 1930-31.

The number and average yield of milk of all cows recorded, and of full-year cows, for each year since 1917-18, are shown in Table XII.

Increased average yields were secured by 43 of the 49 Societies, the exceptions being in the far north of England and in Wales. The highest average yield was obtained by the Derby and District Society with 8,670 lb. (839 gal.), followed closely by Essex with 8,507 lb. (823 gal.), while Glamorgan, Lancashire, Norfolk, Peak, Suffolk and Yorkshire also exceeded 8,000 lb. (774 gal.). Eighteen societies had average yields between 7,500 lb. (726 gal.) and 8,000 lb. (774 gal.), and twelve societies secured yields between 7,000 lb. (677 gal.) and 7,500 lb. (726 gal.).

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TABLE XII.—AVERAGE YIELD OF RECORDED COWS

Year Oct. 1 to Oct. 1	Particulars of all cows and heifers recorded			Particulars of cows recorded for full year			
	No. of cows and heifers	Total yield	Aver- age yield*	No. of cows	Percen- tage of total cows and heifers	Total yield	Aver- age yield*
		Gal.	Gal.			Gal.	Gal.
1917-18	19,793	8,426,958	426	8,775	44	5,255,923	599
1918-19	37,880	16,204,941	450	17,989	47	10,543,516	579
1919-20	61,323	29,344,887	479	27,266	44	17,363,347	637
1920-21	97,903	48,512,380	495	48,248	49	30,892,620	640
1921-22	117,023	60,463,617	517	63,318	54	41,208,073	651
1922-23	127,151	67,904,224	534	68,349	54	46,956,565	687
1923-24	138,086	73,963,165	535	73,338	53	50,299,884	685
1924-25	148,905	76,419,498	513	77,132	51	51,695,291	670
1925-26	154,322	81,623,788	529	81,669	53	56,102,434	687
1926-27	156,847	82,161,809	524	81,749	52	55,677,261	681
1927-28	149,971	76,896,131	513	77,171	51	51,931,633	673
1928-29	144,812	75,948,485	524	74,171	51	51,207,594	690
1929-30	140,266	75,293,001	537	71,432	51	50,766,464	711
1930-31	137,866	75,357,935	547	71,480	52	51,386,105	719
1931-32	135,912	73,793,949	543	70,826	52	50,243,265	709
1932-33	135,902	73,422,655	540	73,328	54	51,300,933	700
1933-34	141,325	76,274,826	540	74,493	53	52,423,417	704
1934-35	148,426	82,661,157	557	76,178	51	55,921,162	734

* Before 1924-25 the average yield was calculated at the equivalent of 10½ lb. to a gallon, and subsequently at 10¼ lb.

Individual herds with average yields for full-year cows of 8,000 lb. (774 gal.) or over, numbered 1,504 or 35 per cent. of the total number of herds recorded for the full year, as compared with 1,193 (28 per cent.) in 1933-34. The number of herds with averages of over 10,000 lb. (968 gal.) per cow also showed a considerable increase, being 304 against 254 in 1933-34, while 24 herds had average yields of over 13,000 lb. (1,258 gal.). Some examples of the increases that have been effected in the average yields of individual herds since recording was begun are shown in Table XIII.

The standard yield of their breed or type was reached by 22,082 cows as against 17,905 in 1933-34 (Table XIV). Shorthorn cows that gave 9,000 lb. of milk or over, increased from 8,316 to 10,192, and Friesians that gave 10,000 lb. or over increased from 4,818 to 5,796. There were relatively larger increases in the number of Ayrshires, Guernseys,

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TABLE XIII.—STANDARD YIELDS OF BREEDS OR TYPES

Herd	No. of years during which records have been taken	Average yield per cow in first year	Average yield per cow in last year	Increase in annual average yield per cow	No. of full-year cows in last year of period	Cash value of increase of last year over first year at 1s. per gallon	
						Per cow	Per herd
A (Non-Pedigree Shorthorn)	18	Gal 524	Gal 892	Gal. 368	49	£ 18 8	£ 901 12
B (Pedigree Jersey)	5	663	1,045	382	33	19 2	630 6
C (Pedigree Friesian)	7	802	1,202	400	28	20 0	560 0
D (Pedigree Friesian)	11	628	1,058	430	22	21 10	473 0
E (Non-Pedigree Shorthorn)	9	845	1,072	227	22	11 7	249 14

TABLE XIV.—NUMBER OF COWS THAT GAVE THE STANDARD YIELD PRESCRIBED FOR THEIR BREED OR TYPE DURING THE YEAR ENDED OCTOBER 1, 1935, CLASSIFIED ACCORDING TO BREED AND YIELD.

Breed or Type	Standard yield	Yields (in lb)								Total number of cows giving the standard yield
		8,000 to 9,000	9,000 to 10,000	10,000 to 11,000	11,000 to 12,000	12,000 to 14,000	14,000 to 16,000	16,000 to 20,000	Over 20,000	
Ayrshire ..	lb. 9,000	—	458	268	142	79	31	7	2	987
Blue Albion ..	9,000	—	37	21	20	17	6	2	—	103
Devon ..	8,000	42	11	7	4	4	—	—	—	68
Friesian ..	10,000	—	—	1,951	1,312	1,558	586	321	68	5,796
Guernsey ..	8,000	1,065	585	299	134	81	12	4	—	2,180
Jersey ..	8,000	494	236	146	67	59	10	3	—	1,015
Lincoln Red Shorthorn	9,000	—	118	62	40	27	6	1	—	254
Red Poll ..	9,000	—	439	265	151	119	31	7	2	1,014
Shorthorn ..	9,000	—	4,728	2,704	1,407	1,027	235	84	7	10,192
South Devon ..	8,000	115	88	44	23	15	4	1	—	290
Welsh Black ..	8,000	26	11	2	9	6	1	—	—	55
Other Breeds ..	8,000	*67	25	18	12	6	—	—	—	128
TOTALS ..	—	*1,809	6,736	5,787	3,321	2,998	922	430	79	22,082

* Includes 15 Dexter cows with yields of 7,000 to 8,000 lb. (Standard yield for Dexters is 7,000 lb)

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Jerseys and Red Polls, which reached the standard yields of their breeds. The number of cows that gave over 10,000 lb. (968 gal.) was 13,537, an increase of 2,685 over the previous year, and 79 of these gave over 20,000 lb. (1,935 gal.) against 74 in 1933-34. The highest yield during the year was 30,220 lb. (2,925 gal.) given by a Friesian owned by a member of the Essex Society.

The number and average yield of cows of certain breeds recorded in 1934-35 are given in Table XV. As compared with 1933-34 there was an increase of 2,801 in the number of Shorthorns recorded, and Ayrshires, Friesians and Guernseys all showed increases of over 1,000. All the breeds recorded shared in the general increase in the average yield of milk. Shorthorns averaged 7,318 lb. against 7,009 lb. in 1933-34, and Friesians averaged 9,291 lb., an increase of 384 lb. on the year. The average yield of Lincoln Reds was only a little higher on the year, but Ayrshires, Blue Albions, Devons, Guernseys, Jerseys, Red Polls, South Devons and Welsh Blacks all showed increases of 200 lb. or more.

TABLE XV.

Breed or type	Total number of cows and heifers recorded	Particulars of cows recorded for full year			
		Number	Percentage of total of cows and heifers	Total yield	Average yield
				lb.	lb.
Ayrshire ..	6,636	3,278	49.3	24,630,657	7,514
Blue Albion ..	508	303	59.6	2,356,772	7,778
Devon ..	744	470	63.1	2,943,101	6,262
Friesian ..	24,687	13,438	54.4	124,859,095	9,291
Guernsey ..	13,050	6,224	47.6	42,892,467	6,891
Jersey ..	7,834	3,797	48.4	25,194,016	6,635
Lincoln Red ..	2,062	1,050	50.9	7,501,612	7,144
Red Poll ..	6,489	3,742	57.6	28,399,825	7,589
Shorthorn ..	82,440	41,726	50.6	305,361,996	7,318
South Devon ..	1,827	917	50.1	6,214,608	6,777
Welsh Black ..	724	434	59.9	2,539,591	5,852

Issue of Certificates. A record number of Certificates of Merit was issued during the year. Certificates issued in respect of the three years ended October 1, 1935, numbered 665, as compared with 562 for the previous three-year period. In addition, 57 Certificates of Merit were issued during the

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year in respect of earlier periods. Certificates of Merit are awarded, on application by the owner, and on payment of a fee of 5s. per certificate, for cows that have given during a period of three consecutive Milk Recording Years the prescribed yield of milk for their breed or type and have been shown to be regular breeders. The number of members of Milk Recording Societies who obtained Certificates of Merit was 206, an increase of 24 on the year. Certificates issued in respect of the three-year period ended October 1, 1935, numbered 171 for Shorthorns, an increase of 34; 120 for Guernseys, an increase of 35; 117 for Red Polls, an increase of 23; 93 for Jerseys, an increase of 30; but Friesians with 126 showed a small decrease. The highest yields certified for the various breeds were:—Friesian, 67,708 lb.; Shorthorn, 57,655 lb.; Red Poll, 51,827 lb.; Jersey, 49,585 lb.; and Guernsey, 39,920 lb. In addition, it may be mentioned that a Certificate for the period ended October 1, 1934, was issued during the year in respect of a Friesian cow that yielded 71,849 lb. of milk, the highest yield which has ever appeared on a Certificate of Merit. Only one Certificate of Milk Record was issued during the year as compared with 7 in 1934-35.

Register of Dairy Cattle. Volume XIX of the Register of Dairy Cattle was published in June, 1936, and contains particulars of the 722 cows in respect of which Certificates of Merit have been issued since the publication of Volume XVIII, and also particulars of 21 pedigree bulls that qualified for entry on the basis of the yields given by their dams and sires' dams.

Calf and Bull Marking. The number of calves marked under the Ministry's Scheme for the earmarking and registration of calves of milk-recorded cows was 15,233, an increase of 462 over the number for the previous year. Although 90 per cent. of the total were heifers, the number of bull calves marked constitutes a record, and at 1,448 was 150 more than the corresponding number for 1933-34.

The number of bulls being used for service, and which were earmarked and registered by Societies for their members, shows a decline to 32 against the previous total of 41.

Testing for Butter-Fat. The Ministry's Scheme for Butter-Fat Testing made some progress during the year, the number of members having cows tested being 854 against 759 a year ago. Testing was carried out in 924 herds containing over 28,000 cows, the number of cows actually tested being 11,583

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as compared with 9,959 in 1933-34. The Scheme has worked smoothly, but the extra cost of taking regular individual samples seems to act as a deterrent to the commercial farmer, as over 81 per cent. of the herds tested consisted wholly or mainly of pedigree cattle. Table XVI shows the number of cows of each breed whose milk was tested under the Ministry's Scheme during the year.

TABLE XVI.—NUMBER OF COWS TESTED FOR BUTTER-FAT UNDER THE MINISTRY'S SCHEME DURING THE YEAR ENDED OCTOBER 1, 1935, CLASSIFIED ACCORDING TO BREED AND PERCENTAGE OF BUTTER-FAT.

Breed or type	Percentage of Butter-fat								Total number of cows tested	Average percentage of butter-fat
	Under 3	3 to 3.5	3.5 to 4	4 to 4.5	4.5 to 5	5 to 5.5	5.5 to 6	Over 6		
Ayrshire ..	21	219	467	176	20	3	—	—	906	3.71
Friesian ..	566	1,593	661	81	6	1	—	—	2,908	3.26
Guernsey ..	4	13	224	743	997	507	126	25	2,639	4.63
Jersey ..	3	9	40	207	377	382	198	80	1,296	4.86
Lincoln Red ..	4	86	61	21	3	1	—	—	176	3.54
Red Poll ..	25	177	300	130	17	—	—	1	650	3.65
Shorthorn ..	142	1,018	1,304	321	32	4	1	—	2,822	3.56
Other Breeds	2	23	67	65	25	4	—	—	186	3.97
TOTALS ..	767	3,138	3,124	1,744	1,477	902	325	106	11,583	3.84

Friesians, Shorthorns, Guernseys and Jerseys accounted for over 80 per cent. of the animals tested, the only other breeds that were tested in any considerable numbers being Ayrshires and Red Polls. The number of cows that averaged over 5 per cent. of butter-fat was 1,333, nearly all of which were Guernseys or Jerseys, as compared with 1,190 last year, while 3,221 averaged between 4 and 5 per cent. and 6,262 between 3 and 4 per cent. against 2,953 and 5,304 respectively in 1933-34. The average percentage of butter-fat of all the animals tested was 3.84, a small decrease as compared with the previous year, and there was a corresponding decrease in the average percentage of each of the principal breeds tested. Jerseys again obtained the highest average with 4.86 per cent., while Guernseys averaged 4.63 per cent.; Ayrshires 3.71 per cent.; Red Polls 3.65 per cent.; Shorthorns 3.56 per cent., and Friesians 3.26 per cent.

Rationing. The practice of feeding individual cows according to their yields continues to become more extensive amongst members of Milk Recording Societies, and reports

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TABLE XVII.—MILK RECORDING SOCIETIES.

STATEMENT GIVING PARTICULARS OF THE 49 MILK RECORDING SOCIETIES OPERATING DURING THE YEAR ENDED OCTOBER 1, 1935.

(The Societies are arranged in order of total numbers of Cows recorded.)

Society	*No. of Members	*No. of Herds	Total No. of Cows recorded	No. of Cows recorded for full year	Average yield of Cows recorded for full year
Essex County	228	271	11,150	5,789	8,507
Suffolk	303	344	9,975	5,212	8,128
East Sussex	239	271	8,925	4,570	6,990
Hampshire	191	225	7,883	4,053	7,317
Berkshire	165	195	7,028	3,704	7,350
Somerset and North Dorset	176	200	6,720	3,819	7,411
Norfolk	194	215	6,433	3,949	8,081
Hertfordshire County	180	198	6,163	3,320	7,689
Kent	133	158	4,928	2,393	7,343
West Sussex	121	135	4,759	2,351	7,554
Surrey	138	148	4,356	1,917	7,411
Lancashire County	107	115	4,284	1,648	8,041
North Wilts	74	89	3,876	2,232	7,162
Gloucestershire	112	122	3,522	1,923	7,677
Yorkshire	110	114	3,298	1,274	8,099
Oxfordshire	86	95	3,205	1,773	7,532
Buckinghamshire	99	107	3,095	1,539	7,603
Leicestershire and Rutland	82	87	2,910	1,362	7,123
Warwickshire	99	103	2,877	1,438	7,695
Cambridgeshire and District	80	91	2,750	1,328	7,695
Shropshire	65	67	2,647	1,251	7,185
Dorset	45	63	2,588	1,566	7,204
Staffordshire	70	72	2,532	1,351	7,804
Northamptonshire	66	73	2,400	1,157	6,998
Bristol and North Somerset	72	77	2,227	1,277	7,132
Nottinghamshire	49	51	2,190	979	7,668
Cumberland and North West- morland	82	84	2,085	869	6,299
Cheshire County	52	55	2,066	997	7,597
South Wilts	32	41	1,943	1,223	7,854
South Devon and District	88	89	1,898	923	6,787
Bedfordshire	54	55	1,774	888	7,863
Derby and District	50	51	1,716	830	8,670
Durham County	51	53	1,546	743	7,538
Worcestershire	54	55	1,424	662	7,643
Peak (Derby)	50	51	1,383	568	8,095
Northumberland	42	47	1,383	719	7,432
Lincolnshire	28	30	1,246	631	7,589
East Devon	52	52	966	573	6,833
Kendal and South Westmorland	35	36	922	382	6,500
Cornwall	45	45	764	400	6,750
Monmouthshire and Brecon	30	30	736	368	7,787
Campden, Moreton and Dist. (Clos.)	29	29	731	416	7,331
Denbighshire and Flintshire	26	26	646	374	6,895
Anglesey and Caernarvonshire	46	46	638	386	5,638
Cardiganshire	21	22	601	330	7,786
Herefordshire	21	21	418	220	7,968
Cardiganshire	22	22	332	187	6,860
Glamorgan	14	14	251	147	8,409
Pembrokeshire	14	14	236	167	6,958
TOTALS	4,222	4,654	148,426	76,178	7,586

* Herds of Goats are not included.

LIVE STOCK IMPROVEMENT SCHEME REPORT

received by the Ministry indicate that in some Societies all the members now pay strict attention to rationing. Advice is usually obtained from the County Agricultural Organizers.

Cost of Milk Recording. There was a small reduction in the average cost of milk recording, per cow, over the whole country. The average amount paid by members of the Societies was 4s. 2d. per cow, while the Ministry's grants averaged 1s. 10d. per cow, as compared with 4s. 3d. and 1s. 11d. respectively in 1933-34.

NOTE.—Detailed information concerning the Ministry's Live Stock Improvement Scheme is given in the following memoranda, copies of which may be obtained (single copies free of charge) on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1 :—

Form No. A763/T.L.—Scheme for the Improvement of Live Stock.

Form No. 609/T.L.—Bull Grant Regulations.

Form No. 466/T.L.—Boar Grant Regulations.

Form No. 89/T.L.—Heavy Horse Regulations.

Form No. 392/T.L.—Milk Recording Regulations (including the Butter-fat Testing Regulations and the Regulations relating to the Progeny Recording of Dairy Bulls, which are printed as separate pamphlets).

Form No. A899/T.L.—Guide to the Licensing of Bulls in England and Wales.

WEEDS

A. EWING REID,
Queensland, Australia.

SCIENTIFIC research is now applied to everything, and weeds have come in for their share of investigation. Some species have been transformed into valuable plants; but, for the most part, weed destruction has been compassed by all the ingenuity of man. Weeds have been attacked from all angles: they have been the subject of legislation; and they have been fought by mechanical, by chemical, and by biological methods, from the ground and from the air.

Modern Seeds and Noxious Weeds Acts attack weeds through education, by encouraging the use of clean seed, by prohibiting the sowing of the seeds of weeds, and by the compulsory destruction of noxious weeds. The mechanical methods used vary from the use of the primitive wooden implement to the gigantic roller that crushes acres of Mallee Scrub a day. Modern implements, better, cheaper and quicker methods using the power of the internal combustion engine, have accelerated weed-destruction enormously. With machinery, one man in Queensland can turn over and destroy fifty acres of weeds in a day.

Chemical attack is becoming commoner and more effective every season. The ordinary method employed is to spray the weeds with poison, and this has been done on foot, by tractor, by car, and by aeroplane. Huge areas can be quickly and inexpensively treated, but it is of great importance that stock should be able to feed over the poisoned area with impunity.

The biological methods employed against weeds are numerous, and in Queensland provide one of the most successful instances of the application of science to weed destruction. Millions of acres of land were rendered worthless by the growth of a particularly obnoxious weed, Prickly Pear, a cactus, useless for stock feed because of its hard, sharp spikes. By the introduction of a small insect, *Cactoblastis cactorum*, quite out of proportion to the length of its name, this land has been entirely cleared of the weed

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and is now utilized for agriculture. The writer spent years fighting this weed by the then known methods, viz., by making numerous incisions in the plant and inserting arsenic therein; and later by the improved method, subsidized by the Queensland Government, of spraying the plants with an atomized mixture of sulphuric acid and arsenic pentoxide. The former method proved useless, and the latter was only temporarily successful. Some idea of the physical labour involved can be realized from the fact that one thickly infested "paddock" had an area of 10,000 acres, and the rest of the holding—some 48,000 acres—had to be combed for scattered infestations. At that time the weed was spreading at the rate of a million acres per annum. Then the biologist discovered the insect for us, and this has further enhanced its reputation by ignoring every other plant but the prickly pear. Now, armed with a small box containing thousands of eggs of the insect—the first eggs were obtained from insects bred in the laboratory—the farmer goes among the prickly pear and pins a few eggs to a leaf here and there. The eggs hatch out and the resultant grubs eat out the inside of the entire plant, leaving a dry, dusty shell. The life history of the insect is repeated twice yearly—the newly-hatched insects fly in myriads to the nearest growing prickly-pear plants and lay their eggs; and thus, from the original "inoculation," millions of acres have been cleared. The great difficulty in applying this method of destruction to other noxious weeds is the finding of insects that will confine their attentions respectively to a single species of weed and not attack other plants.

A flame-throwing implement that will scorch up weeds has also been employed with success, and has the additional advantage that both plant and seed are destroyed. Weeds, however, still persist, and always will, because, after all, they are but plants out of place. If weeds have given us our best and most useful plants, some of our most highly-cultivated plants have become our worst weeds. One cannot but admire the life histories of weeds. Spurned by all and cast out of cultivation, the weeds come up, showing greater tenacity of life and a more vigorous growth than cultivated species, seeding sooner and more prolifically.

I like the dictionary definition of the word "weed" as a "useless and harmful plant," for it exonerates the buttercup in my pasture land, my poppy in the arable land, and my

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daffodils—at least partially—from the stigma of the definition. Who could describe the beauty of the yellow buttercup in the green meadow, the splash of red of the poppy among the golden grain, or a field of waving daffodils, as useless and harmful? Yet, I suppose that a pasture all grass, a grain crop all grain, and the daffodils in nice straight rows in the garden or under field cultivation, would be more in keeping with the steel pylons of an efficient age.

The destruction of weeds was, doubtless, among the first cultural efforts of our ancestors. That the benefits of weed destruction were early realized we know from Columella (first century), who, in his *De re Rustica*, states: "if these [weeding and sarching—a kind of hoeing] are neglected the produce of the fields will be greatly diminished—in my opinion, he is a very bad farmer who allows weeds to grow along with the corn, for the produce will be greatly lessened if weeding is neglected."

Yet, in Saxon times—in fact, until the introduction of root crops (turnips, mangolds, etc.) and the Norfolk rotation of crops—the common custom was to depend on weeds for summer feed. In the seventeenth century, Sir Thomas Browne wrote: "a rural charm against Dodder, Lettice and Strangling Weeds is by placing a chalked Tile at the four corners and one in the middle of the field." One can only regret that it was not stated how effective this inexpensive method proved! We know, however, that dodder is still a noxious weed, and its presence in seed is controlled in Britain under the Seeds Act of 1920.

In Scotland, from whose sturdy, independent tenant-farmers originated so many advances in the practice of agriculture, a Statute for the eradication of weeds existed as early as the thirteenth century.

It was a Statute* of Alexander II of Scotland (1214-1249) that ordered:—

De manaleta.—Of Guld.† Gift the malar [tenant] puttis guld in thi land and will nocht delieur it and clenge it he aw to be punyst as he that ledis ane host in the kingis lande or the barounis [puniri sicut seductor qui ducit exercitum in terra domini Regis vel baronis].§

De manaleta in terris.—Of Guld in corn. 'And gif thi natiff man or thi bonde [servant] haf fylit [fouled] ~~thi~~ land with guld for ilk [every] plant of it he sall gif to the or any other lord a mutone [wether sheep] to be forfalt [forfeited] and neuer thi les he sal clenge thi land of thi guld.

* *The Acts of the Parliaments of Scotland*, ed. 1844, Vol. I, pp. 750, 751.

† Corn Marigold (*Chrysanthemum segetum*).

§ i.e., he should be hanged.

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This is a concise and very clear Act—judging from the penalties to be exacted for commission or omission, an Act likely to receive careful attention. According to Sir John Sinclair's *System of Husbandry*

They seem to have paid more attention formerly, at least in some parts of Scotland, to the extirpation of annual weeds, than is thought at present. It is recorded that an intelligent landlord, Sir William Grierson, was accustomed to hold *Gool* (chrysanthemum) courts for the express purpose of fining farmers on whose crops three heads, or upwards, of that weed were found. Such a practice, if generally adopted, would soon extirpate annual weeds.

A better description of the working and effect of the old Act will be found in *The Statistical Account of Scotland*,† drawn up from the communications of the Ministers of the different parishes by Sir John Sinclair. Referring to the Parish of Cargill, Perthshire, it states:

An old custom takes place in this parish, called *Gool-riding*, which seems worthy of observation. The lands of Cargill were formerly so very much over-run by a weed with a yellow flower that grows among the corns, especially in wet seasons, called *Gool*, and which had the most pernicious effects not only upon the corns while growing, but also in preventing their winning [drying] after cut down, that it was found absolutely necessary to adopt some effectual method of extirpating it altogether. Accordingly, after allowing a reasonable time for procuring clean seed from other quarters, an act of the baron-court was passed, enforcing an old Act of Parliament to the same effect, imposing a fine of 3s. 4d. or a wedder sheep, on the tenants, for every stock of gool that should be found growing among their corns at a particular day, and certain persons, styled *gool-riders*, were appointed to ride through the fields, search for the gool, and carry the law into execution when they discovered it. Though the fine of a wedder sheep, originally imposed for every stock of gool found growing in the barony, is now commuted and reduced to 1d. Sterling, the practice of gool-riding is still kept up, and the fine rigidly exacted. The effects of this baronial regulation have been salutary, beyond what could have been well expected. Five stocks of gool were formerly said to grow for every stock of corn through all the lands of the barony, and twenty theaves of barley did not then produce one boll. Now the grounds are so cleaned from this noxious weed, that the corns are in high request for seed; and after the most diligent search, the gool-riders can hardly discover as many growing stocks of gool, the fine for which will afford them a dinner and a drink.

After 700 years, our weed legislation is substantially the same as that of our less scientific ancestors. Modern methods may make weed control very much easier, but one wonders whether our most exacting inspectors would compare favourably with the old gool-riders in "getting things done."

* Ed. 1814, Vol. I, p. 358.

† Ed. 1794, Vol. XIII, pp. 537 and 538.

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In many countries, the control of noxious weeds is vested in the local authorities, who can order the destruction of any noxious weeds within a given period and, in the event of failure to comply with such orders, can do the work themselves and recover the cost from the owners. In the United States of America, failure to comply with an order to clear renders the owner of the infested land liable to a fine of 5 dollars per day until the clearing is completed, and the cost is added to the tax roll and recoverable as are other taxes on the land.

MILK-PRODUCTION COSTS AT THE AGRICULTURAL RESEARCH INSTITUTE OF NORTHERN IRELAND

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At the present time, when the profitability of milk production is a common topic of public and private debate, any actual costs are likely to be of general interest. It is hoped that the figures presented in this article concerning the expenditure incurred in the milk-production enterprise on the 500-acre farm of the Agricultural Research Institute of Northern Ireland will provide a useful example of the way in which costs have worked out in practice during recent years.

It is, of course, dangerous to attempt to draw broad and general conclusions from costs on one farm. The conditions affecting the particular case have to be kept constantly in mind, so that the presentation of the figures must be prefaced by a description of the herd in question. The accounts were begun in the spring of 1928, when the herd was founded by the calving of a number of bought-in heifers. After that the herd was built up by breeding and purchase until it numbered between 60 and 70 cows in 1932, at which size it has since been maintained. It consists of cross-bred Shorthorns, mated to pedigree dairy bulls. On the whole, the cows are of good size and type, and have given quite satisfactory milk yields commercially, as instanced by the fact that quite a number of lactation yields of 1,000 gal. and over have been recorded in the herd. At the end of the period under review, there were, indeed, 16 cows in the herd that had reached the 1,000 gal. standard. One home-bred heifer had the distinction of winning the cup for the best recorded first-calf heifer in Northern Ireland in 1934. Grade A, tuberculin tested, milk has been produced from the foundation of the herd, and the Institute consistently did well in the Northern Ireland clean-milk competitions, winning the first place in 1933.

The herd has been maintained free from tuberculosis with relatively little difficulty. Twenty-seven cows failed in the tuberculin tests during the eight years, but probably only

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seven of these actually became infected while in the herd. Twenty out of the twenty-seven failures occurred in cows undergoing their first regular test after coming into the herd, and, although they had passed the test before coming into the herd, as, of course, all new cows have to do, it seems likely that they were already infected when they were bought. Only four cows died during the eight years, from various causes, and the only serious disease experienced was an outbreak of contagious abortion in the summer of 1930 which affected most of the cows in the herd during the following three years.

While a number of experimental observations have been made on the milk, and the herd has been used to test different methods of combating contagious abortion, the only experimental work that makes the feeding and management of the herd at all different from ordinary good commercial practice is the addition of a mineral mixture to the concentrate ration of half the cows. This experiment has had no effect on the costs and production of the herd, so that the figures given here may be considered as applying to a purely commercial enterprise.

Apart from the character of the herd, it is extremely important to bear in mind the methods of computing the costs. The general principle of the Institute accounts is that each enterprise is charged only with the costs that are clearly incurred for it. Arbitrary methods of allocating costs and estimating values are, as far as possible, avoided. For this reason, no credits are allowed to the milk account for manurial values of feeding stuffs and no value is put on newly-born calves, which are regarded as a by-product in dairy farming. Also no attempt is made to debit the various departments of the farm with proportions of overhead costs and rent, since any method of allocating these charges always entails arbitrary assumptions.

The costs here presented are thus "prime costs" and in respect of some items will not be comparable with costing results of the type more frequently presented. "Prime costs" have the advantage that each item in them represents a definite material or service provided for the cows. Such costs must, however, be used with caution if they are to be compared with returns, and if estimates are to be made of possible profits on milk production. The surplus of returns over prime costs on the milk-production enterprise has to be set, along with surpluses or deficits on other enterprises,

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against the rent and overhead costs on the farm as a whole. The rent and overheads have to be more than met by the net surplus on the farm before the farm, as a whole, shows a profit.

With these general considerations in mind, the cost figures may be presented and explained in detail. The figures are given for each year from 1928-29 to 1935-36. The Institute accounting year commenced on March 1 in the first three years of this period, and on April 1 in the later years, but this change of date hardly affects the comparisons given here. Since the herd was changing in size throughout the greater part of the period, it is necessary to reduce the costs to averages per cow, as set out in Table I, so that they may be comparable from year to year. The average number of cows in the herd during each year is really an average of the number of cows in the herd on each day of the year. It is thus an accurate average, but, of course, there is a certain amount of roughness in the average costs for the years when the number of cows in the herd was increasing rapidly. The average costs, will, in general, be increased by this difficulty, since the number of cows in the herd during the winter, when costs are highest, will be greater than the average number for the year.

In calculating the depreciation on the herd, the cows are valued at a standard rate each year, so that when the numbers at the valuation date do not change, the depreciation represents the difference between the cost of new cows and heifers brought into the herd and the price realized for cows going out of the herd. The high depreciation in the earlier years may be attributed to the cost of founding the herd and to the writing down of the book value of the cows to the standard valuation of £22. In 1934-35 the effects of the outbreak of abortion were being felt in the number of cows that had to be sold out of the herd because of sterility. Bulls are depreciated from their purchase price to their selling price as evenly as possible over their time in the herd. Home-bred heifers coming into the herd are valued at a standard rate of £15 per head. The depreciation on the herd would have been increased if they had been brought in at a cost figure, which would have been something like £19.

The labour costs ("wages and horse labour") include all costs of tending, feeding, and milking the cows. They are higher than the costs that would be incurred on a farm not

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TABLE I.—AVERAGE PRIME COSTS* PER COW.

	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Depreciation of Cows ..	£ 9 14 3	£ s. d. 2 14 7	£ s. d. 5 8 4	£ s. d. 5 12 9	£ s. d. 3 14 7	£ s. d. 4 1 0	£ s. d. 5 18 7	£ s. d. 3 16 1
Depreciation and Keep of Bulls ..	3 4 6	1 11 8	1 2 9	1 0 7	0 19 7	1 2 8	1 14 0	1 5 10
Wages and Horse Labour ..	9 13 4	8 7 1	7 13 2	6 12 4	4 19 10	5 3 10	5 15 9	5 10 2
Concentrates ..	13 8 4	15 5 0	12 6 10	11 12 7	5 0 9	5 9 0	6 9 0	6 13 10
Coarse Fodder ..	8 8 8	7 0 3	6 1 2	7 9 11	5 7 6	7 14 10	6 11 2	5 11 2
Grazing ..	0 13 5	0 8 4	0 13 1	0 12 9	0 14 3	0 15 5	0 19 5	0 14 0
Tuberculin Tests ..	2 6 4	0 17 8	0 18 6	0 17 8	0 16 4	0 15 1	0 17 6	0 2 2
Sundries ..	2 16 9	2 18 7	4 2 10	2 4 8	2 0 6	1 10 3	2 1 2	2 2 9
Dairy Costs ..	50 5 7 8 12 8	39 3 2 5 17 9	38 6 8 7 4 9	36 3 3 5 18 1	23 13 4 5 6 7	26 18 1 5 2 7	30 6 7 5 3 0	25 16 0 4 14 6
Average number of cows in the herd during the year ..	58 18 3	45 0 11	45 11 5	42 1 4	28 19 11	32 0 8	35 9 7	30 10 6
Average number of gallons of milk produced per cow ..	19·4	37·3	40·3	57·0	66·6	63·9	63·1	68·2
Pounds of concentrates fed per gallon of milk produced ..	798	798	814	794	624	666	703	729
Average price of concentrate mixture per cwt. ..	3·36 11 2	4·27 10 0	4·11 8 3	4·66 7 0	2·74 6 7	3·02 6 1	3·17 6 6	3·33 6 2

* Prime costs do not include rent and overhead charges.

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producing Grade A milk, but otherwise may be considered representative. They were obviously reduced by the installation of a milking machine in August, 1931, after which three part-time milkers were dispensed with and all the work on the herd was done by the three regular byremen.

With the exception of home-grown oats, the "concentrates" were all purchased in bulk and mixed on the farm, and are charged at cost. Home-grown oats have been charged, roughly, at prices at which equivalent oats could have been bought. Few changes have been made in the concentrate mixture, and the mixture in use at the end of the period was 6 parts of bruised oats, 6 of maize meal, 4 of maize gluten feed, 2 of bran, 3 of soya bean meal, and 3 of cotton meal.

Very great economies have obviously been made in the feeding of concentrates since the early years of the herd. The figures given at the foot of Table I, showing the number of pounds of concentrates that were actually fed for each gallon of milk produced, give a clear example of the saving that can be effected when a definite method of weighing out the rations to the byre is adopted. Up to 1932, the head byreman was given directions—verbal and written—as to the feeding of the cows, but it became obvious that more than the proper quantities were being fed. To prevent this, the rations were weighed out from the lofts each week, the amount allowed being regulated by the actual production of milk from the herd in the previous week. Generally, this allowance is 3 lb. of the meal mixture for each gallon of milk produced, though this quantity is not required during the early part of the grazing season, and additional allowances have to be made when draft cows are being fattened. The system has worked well and has considerably cut down the consumption of concentrates without in any way affecting the milk yields or the condition of the cows. The cost per hundredweight of the concentrate mixture has also been much reduced during the eight years, owing to the general fall in the price of feeding stuffs. The average costs per cwt. of the mixture fed are shown for each year at the foot of Table I.

The headings "Coarse Fodder" and "Grazing" are self-explanatory, but it may be mentioned that the former covers, chiefly, the cost of hay and turnips, practically the whole of which were home-grown and have generally been

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charged to the cows at 3s. per cwt. and 10s. per ton respectively. Relatively small quantities of straw, cabbage and kale, which have been fed at various times, are also included under this heading. The charge for grazing may appear small if compared with other costs of production prepared on a different basis. Grazing is frequently made to appear very expensive when it has to bear rent and overhead charges, but the figures given here represent merely a proportion of the prime costs incurred for manuring, weeding, and cultivating the pastures allocated to the cows according to the numbers grazing and the time they have been turned out.

The cost of "Tuberculin Tests" up to the end of 1934 includes the veterinary surgeon's fees for the regular bi-annual tests on the herd and for tests on purchased cows before they entered it, but, after the Milk and Milk Products Act came into operation and the regular tests on the herd were carried out by the Ministry of Agriculture (Northern Ireland), this heading covers only the cost of tests on new cows before entering the herd. "Sundries" cover a number of costs that are too small to be worth setting out individually, such as hauling and mixing concentrates, laundering overalls, veterinary attendance on sick cows, medicines, milk record fees, upkeep of the milking machine, and the levies paid to the Milk Council.

The costs given in Table I up to this point represent the costs of keeping and producing milk from an "average" cow, the milk being in the raw state as it leaves the byre. Such costs are unaffected by the way in which the milk is disposed of, and are comparable with those on any other farm that produces Grade A milk. The actual costs of disposing of the milk on the Institute farm are given under the heading "Dairy Costs," and refer, of course, purely to conditions at the Institute and to the particular methods of disposal practised. The bulk of the milk is bottled, and these costs include the washing and sterilizing of the bottles and the bottling of the milk. A considerable proportion of the milk is separated and the cream sold wholesale, but surplus cream at flush seasons is made into butter in the dairy. All the sales are to distributors, except that Institute employees are supplied.

Each cow's milk is weighed twice daily at each milking, so that the total production is obtained accurately. The average yield per cow, as given in Table I, is obtained by

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dividing the total production for the year by the average number of cows in the herd during the year. It is, hence not quite the same as an average of lactation yields, but is a figure that more clearly represents the average efficiency of the herd, since it is affected by the length of dry periods. It is the average production per cow per year, rather than the average yield per lactation, that affects costs. The effect of the outbreak of contagious abortion in reducing lactation yields, and also in increasing dry periods by causing many cases of difficulty in breeding and of sterility, is reflected in the lower average milk yields obtained after 1932.

The figure for average costs per cow is reduced to average cost per gallon of milk produced, under the same headings, in Table II. It will be seen from this table that the costs per gallon varied in much the same way, from year to year, as the costs per cow, but the fall in the costs of labour and of feeding stuffs about 1932, is not so marked. The reason for this is, of course, that the milk yields fell at the same time that costs per cow were reduced, though not in so great a proportion.

The figures in the form of costs per gallon will probably make a greater appeal to the interests of dairy farmers than the average costs per cow, since they are more easily compared with the returns side of the milk-production account. Farmers know the price they are getting per gallon of milk, while they seldom know their average returns per cow. Hence it may be as well to emphasize again that the figures in this article represent only "prime costs," and that the milk would have to realize a considerably higher return per gallon than these costs before the milk enterprise could be considered worth pursuing on the farm. On the average, during the past four years, the milk on the Institute farm has cost just about 11½d. per gallon in prime costs. It is, of course, impossible to say exactly how much higher than this cost the average returns would have to be to yield a satisfactory surplus. If, however, one considers the proportion of the total farm expenses that are attributable to milk production, and assumes that the milk production account should bear a similar proportion of rent and overhead charges, it appears that the surplus has to reach something like 4d. per gallon on this farm before "profits" can begin to be made on milk production.

In this connexion, it must also be remembered that it is

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TABLE II.—AVERAGE PRIME COSTS* PER GALLON OF MILK PRODUCED, IN PENCE

	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Depreciation of Cows	d. 2.92	d. 0.82	d. 1.60	d. 1.70	d. 1.43	d. 1.46	d. 2.02	d. 1.25
Depreciation and Keep of Bulls ..	0.97	0.49	0.34	0.31	0.38	0.41	0.58	0.43
Wages and Horse Labour ..	2.91	2.51	2.26	2.0	1.92	1.87	1.98	1.81
Concentrates	4.04	4.58	3.64	3.51	1.94	1.96	2.20	2.20
Coarse Fodder	2.54	2.10	1.79	2.27	2.07	2.79	2.24	1.83
Grazing	0.20	0.13	0.19	0.19	0.27	0.28	0.33	0.23
Tuberculin Tests	0.70	0.26	0.27	0.27	0.31	0.27	0.30	0.04
Sundries	0.85	0.88	1.21	0.67	0.77	0.65	0.71	0.71
Dairy Costs	15.13 2.60	11.77 1.77	11.30 2.15	10.92 1.79	9.09 2.05	9.69 1.85	10.36 1.76	8.50 1.55
	17.73	13.54	13.45	12.71	11.14	11.54	12.12	10.05

* Prime costs do not include rent and overhead charges.

MILK-PRODUCTION COSTS: NORTHERN IRELAND

mainly through milk production that the cost of crops and of rearing heifers is recouped. The prices at which home-grown crops have been charged to the milk account were, in most years, not high enough to cover the actual prime costs of cropping on the farm as a whole, so that on crops there is generally a deficit that must be met out of the surplus on milk. Moreover, the home-bred heifers brought into the herd, as mentioned already, cost more to rear than the standard rate of £15 at which they were transferred to the herd in the books, causing another deficit—in the store cattle account—which has to be met out of the surplus on milk.

It is believed that the figures given in this article, subject to the many unavoidable qualifications as to methods of computation, represent reasonable prime or direct costs of milk production, under practical farming conditions. It is hoped that they will be of interest to farmers for comparison with their own results, and will provide others interested in agriculture with an idea of the general level of milk production costs and of the kind of variations to which they are subject under the vicissitudes of farming.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934 TO 1936 : NUMBER, WEIGHT AND PRICES OF CATTLE CERTIFIED FOR PAYMENTS

IN this JOURNAL for May, August and November, 1935, and May, 1936, information was given regarding the cattle and carcasses of cattle certified for payments under the Cattle Industry (Emergency Provisions) Acts, 1934 and 1935, during the first eighteen months of the Scheme. Similar information is now available for the six months March to August, 1936, and in this article the particulars for these months are set out on similar lines to those previously published and are compared with the data for the corresponding period a year earlier.

As mentioned in the previous reports, the classes of cattle in respect of which payments are made are steers, heifers and cow-heifers; a cow-heifer is defined as an animal which has calved and which has grown not more than six permanent incisor teeth. The standard required, from September 1 to December 31, 1934, was that an animal should have an estimated killing-out percentage of not less than 52 per cent., and, from January 1, 1935, a killing-out percentage of not less than 54 per cent. has been required.

Table I shows the total number of cattle certified in each month from September 1, 1934, when the Scheme came into operation, to August 31, 1936.

It will be noticed from the table overleaf that there were increases in each quarter of 1935-36 as compared with the corresponding quarter of 1934-35, the increase being relatively greatest, 17 per cent., in the autumn of 1935, and least, 3 per cent., in the spring of 1936. Over the whole twelve months, $9\frac{1}{2}$ per cent. more animals were certified in the second year of the Scheme than in the first year.

As regards the different classes of animal, increases in the second year of the scheme were higher in the case of heifers and cow-heifers, with increases of $13\frac{1}{2}$ and $19\frac{1}{2}$ per cent., respectively, than in the case of steers, where the increase was only $6\frac{1}{2}$ per cent.

As has been pointed out in previous articles, the rate of marketing of fat cattle from month to month cannot be judged accurately from the figures in the table above. The figures for each month have, however, been adjusted in order to allow comparison in the rate of marketing from month to

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE I

	STEERS No.		HEIFERS No.		COW-HEIFERS No.		TOTAL No.	
	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35	1935-36	1934-35
September	74,581	62,104	63,248	49,534	4,521	3,792	142,350	115,430
October	77,652	69,276	65,826	58,466	4,558	4,592	148,036	132,334
November	66,745	58,411	60,529	50,749	4,702	4,131	131,976	113,291
Total: September to November	218,978	189,791	189,603	158,749	13,781	12,515	422,362	361,055
December	74,896	63,638	58,539	51,083	4,410	3,832	137,843	118,553
January	83,531	82,094	54,066	51,862	5,663	4,953	143,560	138,909
February	85,380	77,696	47,629	41,212	5,423	4,421	138,432	123,329
Total: December to February	244,107	223,428	160,234	144,157	15,496	13,206	419,837	380,791
March	99,721	86,708	48,062	39,599	6,051	4,616	153,834	130,923
April	95,833	102,732	41,645	40,917	5,463	4,811	142,941	148,460
May	91,130	96,633	37,433	36,825	5,393	4,655	133,956	138,113
Total: March to May	286,684	286,073	127,140	117,341	16,907	14,082	430,731	417,496
June	81,685	75,118	47,729	38,873	6,148	4,391	135,562	118,382
July	65,804	70,977	58,196	55,883	5,990	4,950	129,990	131,810
August	67,846	62,178	62,410	53,383	5,656	4,366	130,912	119,927
Total: June to August	215,335	208,273	168,335	148,139	17,794	13,707	401,464	370,119
TOTAL (12 months)	965,104	907,565	645,312	568,386	63,978	53,510	1,674,394	1,529,461

month. In these adjusted figures, which are given in Table II, allowance has been made for the fact that a large proportion of fat-cattle markets are held on Mondays, and that the number of markets held decreases day by day as the week proceeds. It will be seen that, in both years, marketings decreased from October to December, followed by a rise in January. In the early months of 1935 there was a rise until April-May, followed by decreases in June and July. The general course was fairly similar in the second year, but marketings were heaviest in February, and decreased marketings began to show in May; a month earlier than in 1935.

TABLE II

	1935-36 No.	1934-35 No.
September	141,030	123,602
October	142,713	119,971
November	138,418	117,709
December	128,763	116,358
January	144,232	133,897
February	148,139	133,355
March	143,732	137,356
April	146,373	138,690
May	140,519	138,763
June	126,686	126,714
July	130,598	119,491
August	133,426	123,387

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

Live-weight Certification. Animals certified at Live-weight Certification Centres accounted for 1,627,360 of the total of 1,674,394 animals certified at Live-weight and Dead-weight Centres in the twelve months September, 1935, to August, 1936, an increase over the previous twelve months of 9 per cent.

Table III shows the number of animals certified at Live-weight Certification Centres in England, Wales, Scotland, Northern Ireland and the total for the United Kingdom in the six months March to August, 1936, the period now specially under review, as compared with the same period in 1935. Details of the numbers of each class of animal certified at Live-weight Centres in the six months in each of the agricultural divisions into which the country is divided are given in Table IV.

TABLE III

	March-May				June-August			
	1936		1935		1936		1935	
	Number	Per cent.	Number	Per cent.	Number	Per cent.	Number	Per cent.
England ..	268,031	63.9	262,589	64.5	258,733	66.4	244,374	67.8
Wales ..	15,964	3.8	16,998	4.2	15,502	4.0	13,867	3.8
Scotland ..	101,394	24.2	95,167	23.4	85,973	22.1	74,684	20.7
Northern Ireland	34,119	8.1	32,315	7.9	29,310	7.5	27,732	7.7
TOTAL : United Kingdom	419,508	100.0	407,069	100.0	389,518	100.0	360,657	100.0

It will be seen from the above table that the largest proportionate increase occurred in Scotland, where the number of animals certified in March to May, 1936, exceeded the number certified in the corresponding three months of 1935 by $6\frac{1}{2}$ per cent., and in June to August, 1936, the numbers were over 15 per cent. higher than in the corresponding period of 1935. Wales, on the other hand, showed a decrease of over 6 per cent. in March to May, but an increase of over $11\frac{1}{2}$ per cent. in the following three months as compared with a year earlier.

A comparison between the number of animals certified in the different agricultural divisions (Table IV. See pages 784, 785) shows that, while the number certified in England in the

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

three months March to May, 1936, was 2 per cent. higher than in the corresponding period of 1935, the Northern Division (Northumberland, Durham and the North and East Ridings of Yorkshire) showed the largest percentage increase with 9·3 per cent., the next largest increase being in the North-Western Division (Cumberland, Westmorland, Lancashire, Cheshire, Derbyshire and Staffordshire) with an increase of 6·2 per cent. The largest decrease (6·7 per cent.) occurred in the South-Western Division (Somerset, Dorset, Devon and Cornwall).

As regards the three months June to August, 1936, the number of animals certified in England was 5·9 per cent. higher than a year earlier. The East Midland Division (Nottingham, Leicester, Rutland, Northampton, Buckingham, Oxford and Warwick) showed relatively the largest increase, 13·2 per cent., while the Northern and North-Western Divisions increased by 9·2 per cent. and 8·5 per cent. respectively. The only reduction occurred in the North-Eastern Division (Norfolk, Lincoln and Yorks East Riding), which showed a decrease of 5·5 per cent.

In Wales, the decrease of 6 per cent. in the number of animals certified in the three months March to May, as compared with the corresponding three months of 1935, was shared almost evenly between the Northern and Southern divisions of Wales, as was the increase of 11½ per cent. in June to August.

Each division of Scotland contributed towards the increase of 6½ per cent. in Scotland in the spring of 1936, compared with 1935, the largest increases being 12·7 per cent. in the South-Eastern Division and 7·9 per cent. in the North-Eastern Division. In the following three months, when 15·1 per cent. more cattle were certified than in June to August, 1935, there was an increase of 30·1 per cent. in the North-Eastern Division and increases of 17·7 per cent. and 17·3 per cent. respectively in the North and North-West Division and the West and South-West Division.

As regards the relative proportions of steers, heifers and cow-heifers certified at Live-weight Centres in the United Kingdom, March to August, 1936, as compared with a year earlier, the comparative statement of percentages in Table V shows that the percentage of steers was less in each of the six months of 1936 than in 1935. Steers in both years formed the highest percentage of the total in May, and the percentage

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

of steers fell off rapidly when grass-fed cattle came on the market.

TABLE V

Month	STEERS		HEIFERS		COW-HEIFERS	
	1936	1935	1936	1935	1936	1935
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
March ..	64·8	66·1	31·4	30·4	3·8	3·5
April ..	67·0	69·1	29·3	27·7	3·7	3·2
May ..	68·0	69·7	28·1	26·9	3·9	3·4
June ..	60·1	63·3	35·5	33·0	4·4	3·7
July ..	50·3	53·6	45·2	42·7	4·5	3·7
August ..	49·7	51·5	46·3	44·9	4·0	3·6

Dead-weight Certifications. The total number of animals certified at Dead-weight Certification Centres in the six months March to August of 1936 was 23,169 compared with 19,889 in the corresponding six months of 1935. Table VI shows the comparative particulars for each country:—

TABLE VI

Month	England and Wales		Scotland		Great Britain	
	1936	1935	1936	1935	1936	1935
March	3,040	3,104	612	430	3,652	3,534
April	3,012	2,738	592	453	3,604	3,191
May	3,206	3,175	761	527	3,967	3,702
Total : March to May	9,258	9,017	1,965	1,410	11,223	10,427
June	2,827	2,638	817	303	3,644	2,941
July	3,249	2,578	870	455	4,119	3,033
August	2,922	2,801	1,261	687	4,183	3,488
Total : June to August	8,998	8,017	2,948	1,445	11,946	9,462
Total for six months ..	18,256	17,034	4,913	2,855	23,169	19,889

The above figures show that certification on the dead-weight basis increased in the six months by almost 16½ per cent. as compared with 1935, and that the increase was relatively much larger in Scotland, with a rise of 72 per cent., than in England and Wales, where the rise was 7 per cent.

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

Average Weight of Fat Cattle. The average live-weight (after a deduction of 28 lb. had been made for subsidy payment purposes) of the cattle certified at Live-weight Centres over the whole of the United Kingdom in the six months March to August, 1936, was 9 cwt. 1 qr. 7 lb., which was 16 lb. less than the average in the corresponding six months a year earlier. The average live-weight for each of the six months was as follows: March, 1936, 9 cwt. 2 qr. 1 lb.; April, 9 cwt. 1 qr. 19 lb.; May, 9 cwt. 1 qr. 6 lb.; June, 9 cwt. 0 qr. 26 lb.; July, 9 cwt. 0 qr. 22lb.; and August, 9 cwt. 0 qr. 22lb. With the exception of March, in which the average weight was lighter in 1936 than in 1935 by only 7 lb., the average weights quoted above range from 15 to 23 lb. less than the average weights in the corresponding months a year earlier. From the following comparative statement it will be seen that the reduction in average weight over the six months was greater in cattle certified in Northern Ireland, where the average weight decreased by 22 lb., than in England and Wales and Scotland, where the decreases were 16 lb. and 15 lb. respectively. It will be seen, however (Table VII), that in the three months March to May the average weight in Scotland showed a decrease of only 3 lb., but in June to August the decrease in Scotland was 29 lb.

TABLE VII

	Average weight over 3 months, March to May		Average weight over 3 months, June to August		Average weight over 6 months, March to August	
	1936	1935	1936	1935	1936	1935
	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.	Cwt. qr. lb.
England and Wales ..	9 1 20	9 2 7	9 0 22	9 1 10	9 1 7	9 1 23
Scotland ..	9 3 9	9 3 12	9 2 13	9 3 14	9 2 26	9 3 13
Northern Ire- land ..	8 0 17	8 1 14	8 0 12	8 1 3	8 0 15	8 1 9
United King- dom ..	9 1 18	9 2 4	9 0 23	9 1 14	9 1 7	9 1 23

The average dressed-carass weights of the animals certified at Dead-weight Certification Centres, details of which are set out in Table VIII, show a decrease of 13 lb. in the average weight of carcasses certified in England and Wales, but there was an increase of 6 lb. in those certified in Scotland.

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TABLE VIII

	Average weight over 3 months, March to May		Average weight over 3 months, June to August		Average weight over 6 months March to August	
	1936	1935	1936	1935	1936	1935
England and Wales	lb. 621	lb. 621	lb. 600	lb. 626	lb. 610	lb. 623
Scotland	640	631	632	627	635	629
Great Britain ..	624	622	608	626	616	624

Average Prices of Fat Cattle. The average price per live cwt. of fat cattle certified in the United Kingdom in the six months March to August, 1936, was 37s. 2d. as compared with 35s. 2d. in the corresponding six months of 1935. It will be seen from Table IX that, in all parts of the United Kingdom, the average price of certified cattle was higher than a year earlier, though the increase was less marked in Scotland than in England and Wales and Northern Ireland.

TABLE IX

	England and Wales		Scotland		Northern Ireland		United Kingdom	
	1936	1935	1936	1935	1936	1935	1936	1935
March	s. d. 35 2	s. d. 33 5	s. d. 36 4	s. d. 36 1	s. d. 32 4	s. d. 29 10	s. d. 35 2	s. d. 33 9
April	35 11	33 11	37 0	36 0	31 11	29 8	35 11	34 2
May	36 11	35 5	37 6	37 5	33 1	30 11	36 10	35 7
Three months, March to May	36 0	34 4	37 0	36 8	32 5	30 3	35 11	34 7
June	39 1	36 7	40 3	38 11	35 4	32 4	39 2	36 10
July	38 4	35 10	40 3	40 2	34 1	31 11	38 6	36 6
August	37 4	33 11	40 1	37 7	34 7	31 0	37 9	34 6
Three months, June to August	38 3	35 5	40 2	38 11	34 8	31 9	38 6	35 11
Six months, March to August	37 1	34 10	38 6	37 8	33 5	30 11	37 2	35 2

Prices per cwt., dressed-carcaass weight, moved on similar lines, and the average price for the six months March to August, 1936, was 64s. 6d. as compared with 60s. 9d. in the

CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS, 1934-36

TABLE IV.—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM MARCH TO AUGUST, 1936.*

Agricultural Divisions	Steers						Heifers					
	Mar.	Apr.	May	June	July	Aug.	Mar.	Apr.	May	June	July	Aug.
ENGLAND (excluding Monmouth)	East ..	4,933	5,675	6,201	5,992	4,961	3,835	2,668	2,571	2,318	2,683	2,913
	North-East ..	16,625	18,099	18,002	13,623	8,164	7,139	3,554	3,700	3,584	3,721	2,972
	South-East ..	1,952	1,677	1,709	1,663	1,463	1,606	2,240	1,716	1,647	1,995	2,229
	East Midland ..	5,014	4,581	4,064	4,146	6,530	7,343	3,507	2,588	2,348	4,614	7,725
	West Midland ..	5,749	5,888	4,601	3,695	2,562	2,385	5,042	4,029	3,589	4,471	4,793
	South-West ..	4,062	4,171	3,807	3,187	3,580	3,882	3,699	3,071	2,836	3,863	4,995
WALES (including Monmouth)	North ..	15,272	13,582	13,422	10,237	6,416	7,048	6,735	5,353	4,918	8,332	12,157
	North-West ..	4,465	4,058	3,448	3,090	2,454	2,837	5,230	4,039	3,613	4,912	8,235
Total ..		58,072	56,931	55,254	45,633	36,130	36,275	32,775	27,067	24,853	34,591	44,502
SCOTLAND	North ..	2,350	1,301	895	746	1,064	1,594	859	599	496	666	935
	South ..	2,226	4,414	1,150	1,051	1,080	1,227	1,720	1,038	992	1,408	1,688
	Total ..	4,576	2,715	2,045	1,797	2,144	2,821	2,579	1,637	1,488	2,074	2,623
NORTHERN IRELAND	North-East ..	5,151	6,326	5,922	5,050	3,957	3,831	4,739	5,543	4,781	4,439	4,711
	East Central ..	8,283	8,263	9,064	9,663	6,047	6,414	1,836	1,971	1,677	1,299	576
	South-East ..	5,965	4,850	4,879	5,410	3,545	3,854	418	242	359	447	141
	W. and S.-West ..	4,557	4,553	3,232	3,690	3,887	4,141	1,382	1,221	962	1,057	1,648
	N and N.-West ..	838	908	804	787	839	739	570	591	355	418	498
	Total ..	24,794	24,900	23,901	24,600	18,275	18,979	8,945	9,568	8,134	7,660	7,574
TOTAL UNITED KINGDOM		97,365	93,282	88,322	79,312	63,308	65,422	47,061	40,837	36,552	46,776	56,837

* Details of the monthly figures from September, 1934, to February, 1935, are given on pages 144 and 145 of this *Journal* for May, 1935; from March, 1935, to May, 1935, on page 467 of this *Journal* for August, 1935; from June to August, 1935, on page 799 of this *Journal* for November, 1935; and from September, 1935, to February, 1936, on pages 148 and 149 of the *Journal* for May, 1936.

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TABLE IV (continued).—NUMBER OF CATTLE CERTIFIED FOR PAYMENT UNDER THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACTS AT LIVE-WEIGHT CERTIFICATION CENTRES IN EACH MONTH FROM MARCH TO AUGUST, 1936.

Agricultural Divisions			Cow-Heifers					Total						
			Mar.	Apr.	May	June	July	Aug.	Mar.	Apr.	May	June	July	Aug.
ENGLAND (excluding Monmouth)	East ..	131	103	91	109	95	110	7,732	8,349	8,610	8,784	7,969	6,554	
	North-East ..	201	216	187	278	229	169	20,486	22,015	21,773	17,622	11,494	10,286	
	South-East ..	162	154	121	152	162	119	4,354	3,547	3,477	3,810	3,739	3,954	
	East Midlands ..	352	282	274	417	535	570	8,873	7,451	6,686	9,177	14,790	15,534	
	West Midlands ..	468	390	357	413	428	323	11,259	9,507	8,547	8,579	7,482	8,019	
	South-West ..	902	854	926	804	847	791	8,663	8,067	7,569	7,944	7,422	10,332	
	North ..	917	755	918	1,043	1,010	928	22,924	19,600	19,258	19,612	19,592	21,329	
North-West ..	1,557	1,453	1,308	1,432	1,368	1,382	11,252	9,550	8,369	9,434	10,536	12,454		
Total ..		4,690	4,207	4,182	4,738	4,683	4,397	95,537	88,205	84,289	84,962	85,315	88,456	
WALES (including Monmouth)	North ..	126	66	62	97	86	90	3,335	1,956	1,453	1,509	2,085	2,963	
	South ..	283	208	179	172	180	167	4,229	2,660	2,321	2,631	2,948	3,366	
Total ..		409	274	241	269	266	257	7,564	4,626	3,774	4,140	5,033	6,329	
SCOTLAND	North-East ..	67	82	82	119	157	95	9,957	11,951	10,785	9,608	8,825	8,166	
	East Central ..	28	40	34	26	17	28	10,147	10,274	10,775	10,988	6,640	7,039	
	South-East ..	16	18	9	11	5	5	6,399	5,110	5,247	5,868	3,601	4,033	
	W. and S.-West ..	238	241	236	281	306	285	6,177	6,015	4,430	5,028	5,841	6,380	
	N. and N.-West ..	24	17	20	14	23	22	1,432	1,510	1,179	1,219	1,360	1,287	
Total ..		373	398	381	451	508	435	34,112	34,866	32,416	32,711	26,357	26,905	
NORTHERN IRELAND Total ..			284	339	311	372	269	12,969	11,640	9,510	10,105	9,166	10,039	
TOTAL UNITED KINGDOM ..			5,756	5,218	5,115	5,830	5,726	5,315	150,182	139,337	129,989	131,918	125,871	131,729

The Agricultural Divisions comprise the Counties of:—

ENGLAND—

East: Bedford, Huntingdon, Cambridge, Suffolk, Essex, Hertford, Middlesex and York.

North-East: Norfolk, Lincoln and London.

South-East: Kent, Surrey, Sussex, Berkshire and Hampshire.

East Midlands: Nottingham, Leicester, Rutland, Northampton, Oxford and Warwick.

West Midlands: Salop, W. and Worcester, Wiltshire and Hereford.

South-West: Somerset, Devon, Dorset, Cornwall and Devon.

North: Northumberland, Durham and York.

North-West: Cumberland, Westmorland, Lancaster, Chester, Derby and Stafford.

WALES—

North: ..

South: ..

SCOTLAND—

North-East: ..

East Central: ..

South-East: ..

West and South-West: ..

North and North-West: ..

Anglesey, Caernarvon, Merioneth, Denbigh and Flint.

Cardigan, Radnor, Brecon, Monmouth, Glamorgan, Carmarthen and Pembroke.

Nairn, Moray, Banff, Aberdeen and Kincardine.

Angus, Perth, Fife, Clackmannan and Kinross.

West Lothian, Midlothian, East Lothian, Berwick, Roxburgh, Selkirk and Peebles.

Argyll, Bute, Dunbarton, Stirling, Lanark, Renfrew, Ayr, Dumfries, Kirkcubright and Wigton.

Irish, Orkney, Caithness, Sutherland, Ross and Cromarty, and Inverness.

Zealand, Orkney, Caithness, Sutherland, Ross and Cromarty, and Inverness.

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corresponding six months of 1935. Details of average prices per cwt., dressed-carcass weight, are as follows:—

					1936	1935
					s. d.	s. d.
March	..	..	..	..	61 4	59 1
April	..	..	..	..	61 2	57 9
May	..	..	..	..	62 11	60 0
Three months—March to						
May	..	..	..	..	61 10	59 1
June	..	..	..	..	65 8	62 3
July	..	..	..	..	67 3	63 9
August	..	..	..	..	67 10	62 0
Three months—June to						
August	..	..	..	..	66 11	62 8
Six months—March to						
August	..	..	..	..	64 6	60 9

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for September, 1936, are given below, with comparative figures for August, 1936, and September, 1935. The wholesale liquid milk price in September, 1936, was 1s. 3d. per gal., 2d. per gal. more than in August, 1936, and 1d. per gal. less than in September, 1935.

Region	Pool Prices			Producer-Retailers' Contributions		
	Sept. 1936 d.	Aug. 1936 d.	Sept. 1935 d.	Sept. 1936 d.	Aug. 1936 d.	Sept. 1935 d.
Northern	11½	9½	12½	3½	3	2½
North-Western	11½	9½	12½	3½	3	2½
Eastern	12	10	13	2½	2½	2½
East Midland	11½	9½	13	2½	2½	2½
West Midland	11½	9½	12½	3½	3	3½
North Wales	11½	9½	12½	3½	3	3½
South Wales	11½	9½	12½	2½	3	2½
Southern	12	10	13	2½	2½	2½
Mid-Western	11½	9½	12½	3½	3	3½
Far-Western	11½	9½	12½	3½	3	3½
South-Eastern	12½	10½	13½	2½	2½	2½
Unweighted Average ..	11·64	9·70	12·73	2·96	2·85	2·89

These prices do not include any premiums for special services and level deliveries, or the accredited producers' premium of 1d. per gal.

The number of accredited producers was 18,392 and the sum required for the payment of the accredited premium was equivalent to a levy of 0·347d. per gal.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, the same as in September, 1935.

Sales on wholesale contracts were as follows:—

	Sept., 1936 (estimated) Gal.	Sept., 1935 Gal.
Liquid	46,799,737	46,008,741
Manufacturing	26,853,818	20,050,912
	<hr/> 73,653,555	<hr/> 66,059,653
Percentage liquid sales	63·5	69·6
Percentage manufacturing sales	36·5	30·4

The average realization price of manufacturing milk during September this year was 5·656d. per gal., compared with 5·540d. per gal. for September, 1935. The quantity of milk manufactured into cheese on farms was 2,148,191 gal. compared with 2,519,131 gal. in August and 1,559,854 gal. in September, 1935.

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Milk Products Marketing Scheme. Twenty-eight objections and one representation with respect to this draft Scheme were received by September 30, the closing date for the receipt of objections. In accordance with the requirements of the Agricultural Marketing Act, 1931, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have directed a public inquiry to be held into the objections. The inquiry will be conducted by Mr. P. E. Sandlands, K.C., and will be opened in London on November 30, 1936, and adjourned to Edinburgh, where the proceedings will commence on December 10, 1936.

Pigs and Bacon Marketing Schemes: *Pig Price for October, 1936.* The basic pig price (Class I, Grade C.) for October, 1936, was 12s. per score compared with 11s. 11d. for September. The cost of feeding-stuffs ration was 8s. 5½d. per cwt. compared with 8s. 1d. in September, and the ascertained price of bacon was 97s. 7d. per cwt. compared with 95s. 7d. in September. The realization value of offals declined from 8s. 6d. to 8s. 5d. per pig.

Bacon Development Board. The Bacon Development Board have announced their intention to add new conditions, to operate from January 1, 1937, to licences held by bacon curers. The new conditions relate mainly to the general hygiene of bacon factories and cover such matters as drainage, cleanliness and repair of premises and equipment, ventilation, lighting, and facilities for ensuring cleanliness of workers.

Potato Marketing Scheme: Riddle Regulations. New riddle regulations were prescribed by the Potato Marketing Board on October 1, 1936, to operate throughout Great Britain, on and from that date, and until further notice, viz., a minimum riddle of 1½ in. for the varieties King Edward, Red King and Golden Wonder, and a minimum riddle of 1⅝ in. for other varieties.

Board's Report for 1935-36. The third annual report of the Board contains an interesting account of the operation of the scheme during the year ended on August 31, 1936.

The number of producers registered under the scheme in England and Wales was 51,067 and in Scotland 13,400, a total of 64,467. The county with most producers was the Holland Division of Lincolnshire with 4,323; the lowest was Radnor, with 11. The county with the highest average potato acreage was East Lothian with 23·2 acres per registered

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producer; the lowest was Merioneth, with 0.6 of an acre per producer. About half of the registered producers had basic acreages of less than 5 acres.

A full account is given of the operation of the riddle regulations, supplemented by diagrams showing the courses of prices in 1935-36 in relation to those of other seasons. It is stated that, compared with 1930-31, the last season of comparable production before the commencement of the scheme, producers of maincrop-white varieties secured in 1935-36 an increased return of £2 10s. per acre.

The organization of authorized merchants under "Market Plan" Committees was developed during the year. The Market Plan policy was adopted "to prevent the undercutting of prices in transactions with retailers, which in the past, almost invariably had an adverse repercussion on the prices offered by merchants to producers." Plans were in operation in most districts during the season, the principal exceptions being London and certain districts in Lancashire and Yorkshire. The report records the appointment of an Industrial Assistant to conduct investigations into the possible uses of potatoes for industrial purposes. It includes, also, an account of the arrangements made for the manufacture of dried potatoes for cattle foods.

The Board have continued their vigorous publicity policy. Cookery demonstrations were staged at a number of exhibitions, and posters, pamphlets and recipe books have been widely distributed.

Sugar-Beet Marketing Scheme: *Public Inquiry.* A Public Inquiry was held on October 8 and 9 by Mr. F. J. Wrottesley, K.C., the Commissioner appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, into objections with respect to the proposed Sugar-Beet Marketing Scheme.

The Cattle Fund. Payments under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, to producers of certain classes of fat cattle in Great Britain and Northern Ireland amounted, by October 16, to £8,003,019. These payments were in respect of 3,383,647 animals, the average payment per beast being £2 7s. 4d. Some 1,046,497 imported animals have been marked at ports (excluding Northern Ireland) since August 6, 1934, under the marking of Imported Cattle Orders, 1934 and 1935.

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Milk Acts, 1934 and 1936 : *Manufacturing Milk.* Advances made by the Ministry up to October 15, 1936, in respect of manufacturing milk were as follows:—

Section		Period of Manufacture	' Gallons	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936	457,701,577	2,135,187
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
	* Total for England and Wales ..		496,330,755	2,335,500
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to July, 1936	53,800,499	343,487
	TOTAL ..		550,131,254	2,678,987

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Milk-in-Schools Scheme. Exchequer contributions up to October 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 41,664,242 gal. of milk to school-children at reduced rates during the months October, 1934, to July, 1936, amounted to £772,147. From October, 1935, to July, 1936, 18,814,075 gal. of milk were consumed as compared with 20,416,530 gal. in the corresponding months of the first year of the Scheme. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards, or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland, to be 5.99 pence per lb. for the month of October, 1936.

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Wheat Act, 1932 : *Sales of Home-grown Wheat, Cereal Year, 1936-37.* Certificates lodged with the Wheat Commission by registered growers during the period August 1 to October 2, 1936, cover sales of 2,318,343 cwt. of millable wheat as compared with 5,979,258 cwt. in the corresponding period (to October 4) in the last cereal year.

Sugar-Beet : 1936-1937 *Campaign.* The manufacturing season opened at two factories in the last week of September, and nine factories were in operation in the first week of October. Though the development of the crop was retarded by climatic conditions during a large part of the growing period, preliminary returns of field sampling data indicate that, as a result of improved weather conditions during harvesting, the yield of beet per acre and the sugar content, will be about equal to the average of previous years.

Sugar Industry (Payment of Assistance) Rules, 1936. In accordance with the provisions of the Sugar Industry (Reorganization) Act, 1936, the Minister of Agriculture and Fisheries, with the consent of the Treasury, has made the above-mentioned rules governing the payment of assistance in respect of sugar manufactured in Great Britain from home-grown beet. The rules have been issued as Statutory Rules and Orders, 1936, No. 1082, and copies may be obtained from H.M. Stationery Office, price 2d., post free 2½d.

National Mark Wheat Flour Scheme : *Bakers' and Confectioners' Exhibition, 1936.* In the British Wheat Flour Competition held at this Exhibition, the class for all English (Yeoman) Wheat Flour milled to National Mark standards, attracted 11 entries from authorized miller-packers in the National Mark Scheme. The gold, silver and bronze medals and diplomas offered by the Ministry to the winning entrants were awarded by the judges as under :—

Gold Medal and Diploma.—Goodacre & Everard, Ltd., Lower Mills, Loughborough, Leics.

Silver Medal and Diploma.—Joseph Smith & Co., Ltd., Roller Flour Mills, March, Cambs.

Bronze Medal and Diploma.—James Nutter, Station Mill, Fulbourn, Cambs.

The gold medal offered by the Ministry to the farmer supplying the largest proportion of wheat used in the winning flour, was gained by Mr. J. Tudhope, Five Oaks Dairy Farm, Stamford-on-Soar, Loughborough.

The National Farmers' Union offered prizes in Class 60 for the best 1 lb. All English Milk loaf (tin) made from

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National Mark flour. Entries by 11 firms were submitted, and the 1st, 2nd and 3rd prizes were respectively awarded to :—

W. Newman, High Street, Brill, Bucks.

Messrs. W. D. Baldwin & Son, 58, Thoroughfare, Woodbridge, Suffolk.

F. J. Griffiths, Victoria Bakery, Cwmbran, Mon.

National Mark Beef. During the three months ended September 30, 1936, the number of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark were as follows. The corresponding figures for the same quarter of 1935 are given for comparative purposes.

		<i>Home Killed</i>			
		<i>Select</i>	<i>Prime</i>	<i>Good</i>	<i>Total</i>
July, Aug. and Sept., 1936	..	19,264	40,606	1,352	61,222
July, Aug. and Sept., 1935	..	21,596	42,324	1,564	65,484
		<i>Scotch Killed</i>			
			<i>Select</i>	<i>Prime</i>	<i>Total</i>
July, Aug. and Sept., 1936	.. ..		19,806	3,028	22,834
July, Aug. and Sept., 1935	.. ..		16,560	5,397	21,957

The falling-off in the number of sides graded and marked at English centres, is due to an increase in the slaughtering of Canadian cattle at Birkenhead and London.

Grading and Marking of Turkeys, Christmas, 1936. For the fourth year in succession, special arrangements are being made by the Ministry for the grading and marking with the National Mark of home-produced turkeys for the Christmas trade.

All authorized packers in the National Mark Dressed Poultry Scheme are being invited to undertake, on a service charge basis :—

- (a) to collect, kill, grade, mark, pack, and consign home-produced turkeys, or (b) to grade and mark turkeys on producers' premises at agreed rates, which will vary in accordance with the number of birds submitted for grading.

The scheme also provides for the temporary authorization, during the month of December, of producer-dealers, dealers and other producers having an output of not less than 500 turkeys, to apply the National Mark, subject to the usual conditions as to inspection. Producers who cannot reach this figure, or who do not desire to obtain authorization to mark and grade their own turkeys, may either have their turkeys graded on the farm or may send them to a grading centre authorized for the purpose.

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Producer-dealers, dealers or other producers who desire to participate in this scheme, either by becoming temporarily authorized as packers or by having their turkeys graded on the farm or at authorized grading centres, are invited to apply without delay to the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, for full particulars of the scheme.

Progress of the National Mark Apple Scheme. The National Mark Scheme for Apples, which came into operation in 1928, was the first grading scheme introduced under the Agricultural Produce (Grading and Marking) Act, passed in that year. The standards of quality and the methods of grading and packing prescribed were from the beginning recognized by the most progressive growers as ideals to be aimed at, and as affording a basis for the reorganization of the marketing of home-grown apples. The Scheme made steady progress. In 1934-35, a season of abundant crops of sound fruit, the quantity of National Mark apples appearing on the markets was such as to establish beyond doubt the advantage of the Scheme to the apple-growing industry of this country. The 1934-35 season also showed such improvements in the technique of apple production and marketing that it was necessary to consider raising the quality standards laid down in the Scheme. This was done, and the Scheme was revised on the basis of stricter statutory definition of the grades. The new grading came into operation in the 1935-36 season when, however, adverse weather conditions resulted in a very short crop, and only a comparatively small bulk of apples was sold under National Mark labels.

The large quantities of apples appearing under the National Mark in the present season are an indication of continued progress. The influence of the Scheme is to be seen in the increased market supplies of apples packed in standard non-returnable containers. Standardized packs of English apples are now a regular feature of the London fruit auctions which have hitherto been reserved for standardized supplies from abroad.

A new feature on the fruit markets this season, is the produce of the Associated Fruit Growers of Essex, Ltd., a group of Essex fruit growers who are using a common label for their produce, and are giving wide publicity to it. The formation of this Association has had a stimulating effect in

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the county, an additional area of about 780 acres having been brought under the Scheme in Essex alone, during the present season.

The total area brought under the Scheme in 1936 throughout the country is, approximately, 1,800, acres.

National Mark Schemes for Fresh Vegetables : Cabbage Lettuce. The National Mark Vegetables Trade Committee has recommended, in connexion with its consideration of the National Mark Cabbage Lettuce Scheme, that a sub-committee of that committee be formed, for the purpose of classifying lettuce varieties and their synonyms, and of recommending the varieties that are suitable for packing under the National Mark.

The sub-committee is being set up and will be assisted by the Ministry's Horticulture Commissioner and by members of the seed trade.

National Mark Schemes for Cheese. Particulars of cheese packed under the National Mark during the period July 1 to September 30, 1936, are as follows:—

Type of cheese	Number of packers whose cheese was graded	No. and weight of cheese graded	
		No.	Weight
Cheshire :			<i>cwt.</i>
Farm made	199	41,548	20,000
Creamery made	17	29,524	11,122
Caerphilly	14	107,906	—
Cheddar	10	2,780	1,431
Lancashire	16	14,307	4,921
Wensleydale	5	2,658	185
Leicester*	3	272	76
Stilton :			
Blue	9	1,949	204
White		4,564	693
Cream	1	8,789	13

* Grading operations commenced July 28, 1936.

National Mark Creamery Butter Scheme. During the first eleven months of operation of this scheme ending December 31, 1935, 13,644 cwt. of creamery butter was packed under the National Mark. During the first nine months of 1936, the National Mark output was 27,427 cwt. There are 16 authorized packers in the scheme, of whom 14

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are manufacturers, and nearly 4,000,000 labels and wrappers bearing the National Mark have already been used. In view of the satisfactory progress made, the Minister has formally appointed a trade advisory committee, representative of the interests engaged in the production and distribution of home-produced butter, to advise the National Mark Committee and the Minister in regard to the application of the National Mark to creamery butter, and on the general administration of the scheme and the investigational problems involved in the standardization of butter.

The constitution of the National Mark Creamery butter Trade Committee is as follows: Professor H. D. Kay, O.B.E., Ph.D., D.Sc. (Chairman); Messrs. L. Classey, W. J. Cordy, W. B. V. H. P. Gates, M.B.E., D. R. Greig, W. Herman Kent, M.B.E., F.I.S.A., M. L. Oats, F. W. Parsons, T. R. Stanford, O. Thomas, A. Todd, J. H. Wain, and W. W. Waite, M.B.E.

Marketing Demonstrations. Arrangements have been made for demonstrations to be given at the following fat stock shows during November and December.

<i>Show</i>		<i>Location</i>	<i>Date</i> 1936
Norfolk Fat Stock Show	..	Norwich ..	November 19-21
Birmingham ..	..	Birmingham ..	December 2-4
Smithfield ..	..	Agricultural Hall, Islington	December 7-11
Liverpool and District Livestock Society	..	Liverpool ..	December 8 and 9

At the last three shows, above named, the Ministry will stage demonstrations of the operation of the scheme for the direct sale of fat stock from farm to wholesale butcher on a grade and dead-weight basis. Live animals will be exhibited in order to illustrate the types of animals that will kill out at the various carcass grades under the scheme.

A working demonstration of the testing, grading and packing of eggs to National Mark standards will be staged at the Grand International Show, Crystal Palace, London, from November 17-19.

PORTUGAL : Regulation of Bread Supplies.—Three new decrees have been issued recently in Portugal revising the regulations in regard to the trade in bread grains and to bakeries. In consequence of the short 1936 wheat crop, the new supplies will go into consumption immediately, and it is proposed to fix prices in accordance with the new situation. New provisions are also laid down in regard to the milling industry.

In a note accompanying one of the new decrees, it is emphasized that

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the organization of agricultural credit is a problem that remains to be solved. It is possible at present to obtain short term loans from either the Agricultural Co-operative Banks or the "Caixa Nacional do Credito," but recently the latter has interested itself in the question of medium and long term loans and the Government sees in this development the basis for an improvement of the agricultural situation. The organization of such a credit system will only be possible, however, by an extension and improvement of the State organization, and the new decrees will form the basis for the creation of a Portuguese "Food Estate."

The first of the new decrees sets out the prices at which the 1936 wheat crop is to be taken over. Maximum prices are fixed for first and second quality flour, and the prices are graduated according to districts. The production of three types of bread is allowed for Lisbon, but elsewhere only a fine flour type of loaf may be baked. In some districts, however, where it has been the custom to bake bread made of coarse flour, this may be continued. The manufacture of maize and rye bread is only permitted in reliable bakeries, and the same applies to mixtures of flour from different bread grains. The opening of new bakeries will only be allowed under special conditions.

The second decree creates a National Bread Institute. The Institute will be responsible, not only for directing and controlling the manufacture of bread, but will also concern itself with the grading of home-grown wheat according to quality, with technical assistance in the development and improvement of wheat growing, storage, and processing, the examination of home-produced flours and their grading in classes and marks, rules for millers and bakers, including provisions in regard to working hours and the maintenance of milling and baking schools. The funds of the Institute are provided by a State grant included in the annual budget of the Ministry of Agriculture, and by contributions from the general income of the State economic organizations and from the special funds for exhibitions of experimental products, etc.

The third decree creates Guilds of Bakers in Lisbon and Oporto. All persons and corporations concerned in the manufacture of bread in these two places must belong to these guilds. The object of the guilds is to regulate the production of, and trade in, bread, to guard against unfair competition, and to study the interests of the consumer. They must keep statistical records, supervise the carrying out of the legal provisions, and develop technical improvements in baking. Their aims also include the task of improving the conditions of the workers by concluding collective working agreements with the workers' unions, and rendering assistance in trade union and insurance matters. (*Note by the Market Supply Committee.*)

NOVEMBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

IN normal seasons the middle of November is about the dividing line between the past season's activities and the settling down to winter operations. Potatoes and mangolds ought to be stored safe from frost, autumn sowing of wheat or other grain crops should have been mostly completed, and the great majority of working horses and cattle will be settling down in their winter quarters. In the western districts of North Wales, November 12 marks the end of the farm year under most leases and agreements, and, in many ways, it is such a suitable date for the end of a tenancy that it is surprising that it should appear to be the custom only in a restricted area. Though seldom referred to by name, the date—November 13—for the beginning of the tenancy is presumably Old Hallowmas, just as May 13 is celebrated as Old May Day, and April 6 as Old Lady Day.

Though there are no pauses in work on the farm, there is generally the feeling, towards the close of this month, that the end of a period of intense activity has been reached. The owner of a large mechanized farm remarked the other day that he welcomed the shortening days because they came to protect men and tractors! From the commencement of the corn harvest to the end of October, both men and tractors had worked long hours, and experience had taught him the wisdom of giving his men a few days' holiday, and his tractors an overhaul. Where tractors are not used, there is not the same feeling of concentrated effort followed by relaxation; the horse cannot continue working long hours, and, except for a few weeks in the year, its daily work does not call for abnormal effort.

After the middle of the month, most cultivations are designed to prepare land for the following spring rather than for immediate sowing. In particular, the ploughing of stubbles in preparation for next year's root crops engages first attention. In spite of all the research conducted on soils, the scientist can give little guidance to the practical man on methods of obtaining the desired tilth at a given time. Even on such a matter as depth of ploughing for a particular field, few would be so bold as to doubt the judgment of the farmer.

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In general, there is a feeling that autumn ploughing should be deep, and arranged so that the soil may drain freely and have a large surface exposed to frost, but nothing more definite can usually be advised. It is very difficult to obtain definite and clear results from experiments on cultivation, largely because no two seasons are alike and fields vary almost as much, even when they are on the same soil type. Still, it might be expected that by now the effect of deepening cultivation from 8 to 10, or even 12 inches, over a few rotations, might in some instances have been measured.

Similarly, as far as the writer is aware, little information exists regarding the effect of subsoiling. It is perhaps too soon to expect information regarding the value of an operation so recently introduced as Gyrotilling. One farmer was recently heard to say that he liked to see the Gyrotiller on his farm because it was one of the few machines he knew that would do what was claimed for it. Another declared that, whether the process was any good or not, to him it was worth the cost to have the satisfaction of seeing his wretched clay land that had caused him so much trouble all his life, being ripped up and so drastically dealt with in quite an off-hand way! Such reasons may pass in a few instances, but survival of the system depends on the securing of definitely paying results.

November brings in a slackening of the cross-country movements of livestock. Cattle have been bought for the yards, hogs for fattening, and ewe flocks made up to strength. A period of activity begins in the livestock departments, and the dairy herd is usually brought in some time this month, though bad weather or special circumstances may have caused it to be housed in October.

Farm Haulage. At this time of the year, when there is so much carting of roots, it is appropriate to consider the advantages offered by the use of pneumatic equipment for farm carts, waggons and lorries. The increasing popularity of these aids to haulage is evident to observers who have travelled in the country in the past few months. Where pneumatic equipment has been tried, it has quickly led to a repeat order, not only because of the easier hauling, but also because vehicles so fitted are very popular with the carters. On a farm in the north, where one such vehicle was bought for trial, there was continual competition among the men

NOVEMBER ON THE FARM

for this cart, and the difficulty had to be solved by buying another.

Farm transport stood in great need of improvement. With the slow pace of the heavy horse, it is evident that loads should be as large as possible, especially when dealing with materials such as roots or farmyard manure, that contain a high percentage of water and consequently have a low value per ton. With pneumatic equipment, consisting of steel wheels with roller bearings and agricultural tyres, greater speed and heavier loads are possible. The modern agricultural tyre is of a special pattern designed to offer the minimum rolling resistance, and the shoulders are buttressed to provide protection from damage from sharp stones, etc.

A recent bulletin by Mr. Alex Hay (Pneumatic Equipment for Horse-drawn Vehicles, Bulletin No. 2, Rubber Growers' Association) contains interesting information on this subject, besides being illustrated by a number of excellent photographs. In trials carried out by the Institute for Research in Agricultural Engineering, University of Oxford (Agricultural Machinery Testing Committee's Report, No. 46, 1934*), the use of this type of equipment resulted in reductions in draught varying from 13 to 41 per cent. The increase in pay load due to the use of these varied from 35 to 108 per cent., according to ground conditions. It is sometimes suggested that a considerable proportion of the improvement is due to the roller bearings that replace the usual type of bearing; Mr. Hay, from the results of tests carried out, considers that this is not so.

Apart from advantages in regard to draught, pneumatic tyres do not sink to the same extent in arable land, and are not so damaging to grass land as the usual iron tyre; where much carting has to be done on grass land, such as where there are cow bails or large poultry units, pneumatic-tyred wheels are almost invariably used. It may, however, be doubted whether the full benefit of the new type of wheel has been yet obtained. The reduction in the size of the wheel, as compared with the standard wooden type, should be exploited by a lowering of the whole vehicle to economize labour in loading, and advantage should be taken of the lighter draught to provide accommodation for a much larger load. Too often the new wheels are placed under a cart

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, WC 2, Price 3d., post free 3½d

body of conventional design and size, often specially raised in such a way as to nullify the advantages of the wheels. Perhaps the opinion may be hazarded that a long, wide platform with shallow, removable sides will in time be adopted as the most economical in first cost and in everyday operation.

Root Competitions. These competitions, organized by various societies and by seed firms, take place at this period of the year, and, for the next few weeks, the agricultural Press will be recording the prodigious yields attained by the competitors. In judging, yield of crop, spacing, and the appearance of the roots may be taken into account; in some instances, the method of calculating the yield per acre may be open to criticism and lead to yield figures that may be almost described as astronomical, but, this does not detract much from their utility. Beet competitions, which are judged on cultivation, yield, and sugar content, are on a more exact basis, since figures for the two latter are obtained from the factory, and there is less glamour about the judging!

Competitions of this type are useful in focussing attention and raising discussions on the various aspects of successful crop husbandry. Thus, the statement of this year's winner for the best oat crop in the Gloucestershire Root, Fruit and Grain Competition, that he attributes his success mostly to the fact that his land is deficient in lime, cannot but raise many an interesting discussion. Again, these competitions could enable much useful information to be accumulated, such as on the question of spacing in roots. Contests of this type are much encouraged in New Zealand; in the *New Zealand Journal of Agriculture*, Vol. 51, No. 6, it is stated that, in four districts only, a total of 912 farmers entered for the various crop competitions in 1935.

Sheep Feed. Rape, kale, turnips and beet-tops are plentiful this year; this was partly responsible for the high price of store sheep in the autumn. Rape, which may be grown alone, or mixed with turnips, is not suitable for keeping far into the winter, being easily damaged by frost. The damage is not caused so much by the direct action of frost on the leaves, as by the slender leaf stalks getting frozen and snapping off in the wind. Turnips and kale are used as long as possible, having the advantage over swedes of being soft.

NOVEMBER ON THE FARM

Marrow-stem kale, an increasingly popular succulent, is better before the end of January than after, since the lower leaves are lost and the stems get very fibrous and woody if the crop is kept too long. An experiment at Boghall, Edinburgh, indicated that marrow-stem kale is not the equal of swedes for fattening sheep; in one trial, 75 per cent. of the sheep in the swede group were ready for slaughter at a given date, while, on the same date, only 25 per cent. of the kale group were sufficiently fat.

Beet-tops may be as nutritious as swedes if free from adhering soil. Experiments at Cambridge and at the Norfolk Experimental Farm indicate the high value of clean beet-tops, and the importance of attempting to handle and cart off the crop in such a way as to effect the minimum of contamination with soil. Beet-tops should be allowed to lie on the ground for about 10 days before they are used.

There are many qualities of hay this year on most farms, but shepherds generally succeed in getting the best, especially after the ewes have lambed. Though they do not appear to be particularly observant when the hay is gathered in, shepherds seem to have an uncanny knowledge of the distribution of the best lots of hay in the barn! There is probably strong reason for giving the shepherd a free hand in the matter of hay. Folded sheep have to submit to drastic changes of food in regard to succulents, and there is no doubt that, with racks full of good hay, the sheep consume less succulents, and suffer less at the change-over. So great is the variation in the quality of hay, that some lots may have twice the feeding value of others. It is difficult to judge the value accurately by the usual methods, and a recent suggestion by Mr. James Mackintosh, of Reading, that farmers should have analyses made in order to enable them to grade their hay, is deserving of wide attention. In the Wye provincial area, there has been in operation for some time a scheme for the purpose of estimating the starch equivalent of the hay from the protein and fibre contents.

NOTES ON MANURING

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Field Experiments. The interpretation of the results of manurial experiments requires considerable caution. Each year sees the publication of the results of further trials, but it is not always easy to view this new evidence in the right perspective, for, sometimes, the very fact that it is new tends to make it assume an unjustifiable importance, whilst, in other cases, old ideas are so firmly established as to be well-nigh unassailable. A further danger lies in the consideration of tables of yield data with little or no reference to the field conditions under which the trial was conducted. Separated in this way from their descriptive context, yield data may be highly misleading. When artificial fertilizers are used on land previously farmed with little or no manurial treatment, their beneficial effects on crop growth are usually only too obvious from an inspection of the growing crop. In the course of time, however, regular applications of fertilizer tend to raise the level of fertility, and further dressings applied in any particular season may sometimes fail to produce a visible effect on the crop then growing. Unfortunately, the naked eye cannot always judge small yield differences with sufficient certainty to say that a fertilizer application, costing only a few shillings per acre, has or has not produced a profitable increase in crop. Properly replicated field trials, however, will usually give reliable information about much smaller differences than those that can be detected by mere inspection of the growing crop.

A large amount of land in this country is still below the fertility level at which response to fertilizers can only be detected by very elaborate experiments. The large number of farmers who use little or no artificial fertilizer has been the subject of comment by previous contributors of these notes. Anyone who is in close touch with a large area of land, such as an Advisory Province, or a County, is usually aware of land that, through lack of fertilizer treatment in the past, will give a very striking response to an application of fertilizer supplying one or other of the common elements of

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plant food. A fertilizer experiment on such a soil, however, only serves to indicate the needs of neighbouring land similarly neglected in the past, and possibly, also, to demonstrate the way in which the various plant foods affect the crop. To farmers who are familiar with the circumstances, especially those who are farming land in similar low "condition," such experiments afford valuable guidance. To the regular user of fertilizers, however, there are definite dangers from these highly spectacular results, unless it is made clear that they must be interpreted in the light of the low state of fertility of the experimental field. Not only may he lose faith in the value of fertilizers when he fails to obtain an equally spectacular result on his own farm, but he may also be led to use fertilizer dressings entirely unsuitable or uneconomic for his own conditions. In a similar way there is an even greater danger of the non-user of fertilizers being supported in his neglect when faced with the results of trials on land in "good heart," showing only small responses in any one season, unless such results are accompanied by an adequate and convincing description of the original high level of fertility of that land. It is usually far easier to lead the regular user of fertilizers to think that he is not using enough than it is to persuade the unbeliever to use any at all.

Again, so much depends on climatic conditions that the decision as to whether or not any particular fertilizer treatment is likely to prove a sound investment should only be taken in the light of experience extending over a number of seasons, embracing a variety of weather conditions. The effect also of the fertilizer on the following crop or crops in the rotation must not be overlooked. From this standpoint, it is obviously desirable that many manurial experiments, especially those dealing with materials which, if not taken up by the crop, may remain in the soil in a state available to succeeding crops, should as far as possible be continued through the rotation of crops, so that the treatment can be considered from the standpoint of its effect on the rotation as a whole rather than on one individual crop. The fact that, in some districts, crop rotations are no longer adhered to so strictly as in the past is not a serious obstacle to this type of experiment. Many farmers still try to keep to some basic cropping plan for most of their land, and any departure from the rotation is often no more than the replacement of one crop

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by some crop with very similar manurial requirements. Unfortunately, the number of experiments in which it has been possible to follow such residual effects has been relatively small, and, in the past, the farmer has had to rely to a large extent on the results of one-year experiments to guide him in his choice of fertilizers for arable crops. In addition to the obvious disadvantages of such incomplete evidence, these one-year trials have automatically led many farmers to think largely in terms of the immediate requirements of individual crops rather than to plan a standard manuring policy on the lines suggested by Rayns in these notes for October, 1934. To determine the manuring of a field entirely from the standpoint of the next crop to be grown thereon, represents a hand-to-mouth existence that can rarely give the best results. In many years, a large part of the fertilizers applied to any particular crop may not become available in time to be fully utilized by that crop owing to the influence of such factors as drought. In a succession of seasons characterized by generally unfavourable conditions, land farmed on a regular system of manuring designed to maintain the fertility of the soil at a uniformly satisfactory level gives consistently better results than similar land on which an attempt is made to supply direct to the individual crops just what they are expected to be able to utilize in each season. Crops that can draw on a steady reserve of plant food are in a much better position to resist adverse conditions than those which have to depend solely on the immediate availability of fertilizer applications.

Modern developments in the technique of field experimentation have made it possible to determine with reasonable accuracy whether or not even a small yield difference is really due to a particular fertilizer treatment or merely some chance variation from plot to plot, such as the small soil irregularities found on most fields. We are still left, however, with only very cumbersome and rather inadequate methods of defining the actual "condition" or fertility level at which the response was obtained. In time, chemical analysis may make it possible to indicate with greater precision the level of soil fertility at which some particular response to fertilizer treatment may be expected, and thereby enable experimental results to be applied with some confidence to a whole area of land of similar analysis. Before this becomes practicable, however, chemical analysis will have to be more closely

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related to actual response to fertilizers in the field, and field experiments must, in turn, be linked up with the various soil types.

At the present time, once a farmer is convinced of the value of proper manurial treatment, and has adopted a policy based on the general principles of manuring, as determined at such centres as Rothamsted and Woburn, he should look for further guidance to the results of experiments carried out in his immediate neighbourhood on land in similar "condition" to his own. General recommendations as to correct fertilizer treatment for any particular crop should be regarded as only a rough guide, to be modified to suit the "condition" and manuring policy of his own farm.

Soil Conditions in Tomato Houses. A strong, healthy root-system at all stages in the growth of the crop is essential if a good yield of tomatoes is to be obtained. The results of many years' work at the Cheshunt Research Station have served to emphasize that, no matter how liberally the crop is manured, the soil itself must be in good *physical* condition if a satisfactory root-system is to be developed. To ensure satisfactory conditions in the soil and sub-soil throughout the growing season, careful attention must be paid to the winter work in the glasshouse. In addition to the actual digging operations, the need for liming, the application of dung, the incorporation of straw or other coarse organic material, and winter flooding, must all be considered.

The once universal practice of liming for tomatoes has been the subject of considerable criticism in recent years. Good crops of tomatoes have been grown on slightly acid soils, but under such conditions other troubles may arise. On the whole, it is advisable to use sufficient lime to prevent the soil becoming acid, though there appear to be adequate grounds for the suggestion that the heavy dressings used in the past can be substantially reduced. Lime will help to maintain heavy soils in good physical condition, making them more open and thereby facilitating root development, but an annual dressing equivalent to 10 to 20 cwt. per acre of burnt lime, should usually be ample. To be effective, lime must be thoroughly incorporated in the soil, and the best way to do this is to apply the lime in a finely-ground state when the soil is fairly dry, and, if possible, work it into the soil before watering. As regards the use of dung, bacterial action, aeration and soil conditions generally are all improved by the

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application of short, well-rotted horse dung. Such material also supplies plant nutrients, especially nitrogen.

The incorporation of straw in glasshouse soils during the winter digging is sometimes advocated as a means of avoiding, or, at any rate, postponing for a time, the costly operation of soil sterilization. The heavy crops grown on new land that has been in grass for some years are undoubtedly associated with the beneficial effects of the fibrous grass roots and other organic matter. These, by assisting drainage and aeration of the soil, make conditions suitable for extensive root development. The gradual diminution in the yield of tomatoes from a house erected on new land can be overcome to a large extent by the sterilization of the soil, either by steam or chemicals. Experimental work, however, has shown that the trouble is also often associated with loss of physical condition, especially the disappearance of coarse organic material from the soil. Of various methods of maintaining the amount of this coarse organic matter in the soil, the most promising appears to be the addition of straw or peat. Suitable peat material is expensive, but the cost of wheat-straw is not too high for the practice to be an economic success under suitable conditions. The straw is placed almost vertically in the soil, not spread on the surface and dug in, the quantity used being 3 tons per acre each to the top and second spit. Subsequently the straw must be thoroughly wetted. The results of experiments on these lines published to date, suggest that the use of straw in this way is not always desirable, e.g., on light, sandy soil. Decomposition of the straw is brought about at the expense of soil nitrates, and, as sometimes recorded in experiments on green-manuring and the ploughing-in of straw for ordinary agricultural crops, it may temporarily deplete the soil of its available nitrogen to such an extent that, for a time, the crop suffers from nitrogen deficiency. In the Report of Experiments carried out by the Cheshunt Research Station in 1935, further reference is made to this aspect of the problem, and it is stated that whilst, generally speaking, the results of using straw have been excellent on heavy land previously well manured, they vary on average soils, and the treatment is *not* advised on poor, light soils.

Sub-soil dryness is another condition that may interfere with the growth of the tomato crop. This cannot be easily remedied during the actual growing season, and the best treat-

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ment is winter flooding, usually during December and early January. Flooding, both as regards time and quantity, should be regulated according to the conditions in the house to be treated, especially type of soil and drainage conditions—heavy soils can easily be injured by the use of excessive quantities of water late in the winter.

Careful attention to the need or otherwise for each of these winter operations is essential if a satisfactory root-system, capable of taking up the necessary moisture and plant foods, is to be developed and maintained throughout the growing season. The choice of manures, though worthy of serious consideration, is of secondary importance to the preparation of the soil.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Oct. 14th.				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:—					
Neutral (N. 20·6%) ..	6 17d	6 17d	6 17d	6 17d	6 8
Calcium Cyanamide (N. 20·6%)	6 17e	6 17e	6 17e	6 17e	6 8
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
" " (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½% P.A. 20½%)	..	6 10	6 5h	6 5	..
Steamed Bone Flour (N. ½% P.A. 27½—29½%) ..	5 12	5 10	5 0h	4 15	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid;
S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

† Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London districts. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22·4 lb.) so that a manure, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then if the price per ton of such a fertilizer be divided by the percentage figure, the deducted cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Grass and Hay for Winter Feeding. The summer of 1936 will be recorded in the history of most farms as a bad hay year. Some good hay has been won, far more is of only moderate quality, while much is definitely bad. Even on the select few farms that are now equipped with artificial driers, much of the produce probably falls far short of the standards of "concentration" and nutritive value that earlier experience in better seasons had shown to be attainable. Costs of production have certainly been relatively high, and may well serve as a conservative basis for future estimates of the economy of grass-drying.

These facts must needs be taken into account in planning the feeding programme in cattle rearing, cattle feeding and milk production for the coming winter, and for this purpose it is necessary to understand just what contribution good grass or hay can make to the nutrition of the animal, and how this contribution is likely to be affected when the produce has been subjected to adverse conditions.

It must be understood at the very outset that grass, even under perfect conditions, and whether consumed fresh or in the preserved form, is bound to vary considerably in composition and nutritive properties. It consists of the leaves and stems of living plants, and, therefore, whilst on the plant, must be changing in character from day to day, so that all statements as to its quantitative nature can only have a general or average application, from which individual samples may diverge widely.

By far the greater part of the dry substance (and therefore of the nutriment) of grass consists of carbohydrates of varying degrees of digestibility, ranging from easily digestible sugars to the carbohydrates that constitute the "fibre" of the hay and are digested with difficulty. Apart from its direct contribution to the nutritive value of the hay, this "fibre" acts usefully also in producing the relatively high degree of bulkiness that is desirable in the food of the ruminant.

What we usually value most, however, in grass (and greenstuff generally), is the contribution it makes in proteins, minerals and vitamins. Doubtless, good grass contributes, to

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the ration also, other factors of which, as yet, we have little or no knowledge. From the chemical point of view, grass is good if it is relatively rich in proteins, minerals and vitamins, and poor in fibre.

The content of proteins is largely determined by the stage of growth at which the grass is taken, but it is also influenced by other factors, such as soil, season and manuring, which may also affect the amount and nature of the minerals taken up by the grass. Whether these factors also affect the content of vitamins cannot yet be stated with certainty, but this content is certainly subject to variation.

Protein Content. The dry matter of grass in the first 3-4 weeks of growth will often contain 20-25 per cent. of protein, whereas that of grass cut at the more advanced stage usual for haymaking will rarely contain more than 10-12 per cent. Even under the most perfect conditions of preservation, therefore, such as are approached in careful artificial drying, one batch of dried grass cut at a very early stage of growth may contain 2-2½ times as much protein as another batch cut at a much later stage. That such variations are actually being found in drying practice on the farm is already evident in published records of the experience on different farms.

This wide possibility of protein variation must constitute a serious difficulty to any close scientific control of feeding, if dried grass is used to any considerable extent to replace the concentrated foods commonly used in production rations. With the latter class of food, no serious error is incurred in using average figures for protein content, but, clearly, any such assumption for dried grass might prove to be very inaccurate. Where production is closely allied to protein supply, as in the feeding of milch cows, the farmer who proposes to use his dried grass extensively as a "concentrate" will, therefore, be well advised to have frequent recourse to chemical analysis of his product during the drying season, and, if a wide variation is found, to grade it according to protein content—say into three classes, 20 per cent. and over, 15-20 per cent. and under 15 per cent.

Similar considerations arise also in connexion with the feeding of hay, and here the uncertainties due to the natural variations of the grass and the effect of soil and season thereupon are accentuated by the variable losses of protein during the haymaking process. In this case, since recourse to chemical analysis is hardly practicable, it will be well to

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assume that the great bulk of the 1936 hay crop will be well below the average in protein content—and, indeed, in most other respects, with the exception of fibre, which will be well above the average both in amount and indigestibility.

Mineral Content. The dry matter of grass grown under average conditions will usually contain about 8 or 9 per cent. of minerals, and this proportion does not change much with advancing growth until after the flowering stage. It may be appreciably affected both in amount and nature, however, by the mineral status of the soil, rainfall, and manuring. If the grass be left to seed before being cut, some part of the more valuable, soluble minerals may pass back to the soil, especially in wet weather, and this loss is naturally greatly accentuated after cutting if the hay is much exposed to rain. Good hay from land well supplied with the essential minerals is an almost infallible safeguard against mineral deficiencies if it is used in fair quantities; even this year's moderate hay will probably cover the needs of moderate production so far as lime and phosphoric acid are concerned, but may not be adequate with regard to the more soluble minerals, such as potash and salt. For high production of milk it will probably need a "complete" mineral supplement.

Vitamin Content. Grass probably contains all the known types of vitamins, but the amount present may vary considerably according to conditions that cannot yet be defined. Most attention has hitherto been paid by research workers to the content of vitamins A and D, the former being associated with the carotene ingredient of the grass-colouring matters, and the latter produced directly by the exposure to the ultra-violet radiations from the sun. Both are more abundant in summer grass than in autumn or winter growth. The concentration tends to vary from year to year, but the real causes of this variation are still obscure. With the types of drying plant now in use, the loss of vitamin during drying is apparently not very great, nor does much further loss take place during storage of the dried product. Different consignments of dried grass may, however, show considerable variations.

When the cut grass is made into silage, appreciable losses of vitamins may occur, but probably less than in making hay under good conditions. When made into hay under bad conditions, practically all the vitamin A of the grass is lost—a point that must not be overlooked, therefore, during the

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coming winter. Vitamin D is more resistant to "weathering" influences, and poor hay is, therefore, not necessarily much inferior to good hay in this respect.

Fibre Content. The proportion and nature of the "fibre" present in grass varies at different stages of growth, being lowest and most digestible in the early stages; highest and least digestible in the mature plant. The dry matter of young grass commonly contains 15-20 per cent. of fibre of about 80 per cent. digestibility; that of well-won hay 25-30 per cent. fibre of about 60 per cent. digestibility. The contribution of the fibre to the total digestible matter of the grass is thus about the same in each case, but, at the hay stage, the fibre is harder and tougher, and consequently requires more energy for mastication and digestion, and its contribution to the effective productive energy of the grass is correspondingly less. Considering young grass in which the dry matter contains 20 per cent. of fibre, one would credit it with a production value equal to 6-8 per cent. of starch, whereas in a hay in which the dry matter contains 30 per cent. of fibre, one could hardly credit the fibre with any production value. In a very poor hay containing more than 30 per cent. of fibre in the dry matter, the nutritive effect of the other ingredients of the hay would almost certainly be reduced thereby, and its value could not be rated higher than that of straw. The economy of feeding hay of this low quality is doubtful, since, apart from its own low value, it will almost certainly be unpalatable and apt to lead to digestive disturbance and reduced effectiveness of the whole diet. Used as litter, it would add fully twice as much to the manure as if passed through the animal, and, on farms where manure can be effectively used, this would probably be the more effective use to make of it.

Marrow Stem Kale. The merits of this crop are now widely acknowledged, but all too frequently because it takes the place of roots in the cropping, it is regarded as a substitute for roots also in the feeding programme, whereas it is more strictly comparable with grass and hay. This is well brought out in the analyses made recently at Cambridge, in which also thousand-headed kale was included.

Taking the whole plant, marrow stem kale was found to contain about 13-14 per cent. of dry matter throughout the autumn and winter, the proportion thus being singularly constant and rather below that of young spring grass.

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Rather more than one-half of the dry matter was contained in the leaves, a little over one-third in the rinds, and the balance of 10 per cent. in the marrow. The marrow was more watery than the rest of the plant and its dry matter was rich in sugars.

The average proportion of crude protein in the dry matter was 15-17 per cent., including 12-13 per cent. of true protein; thus being closely similar in this respect to young grass of average quality. The similarity extended also to the fibre content, which was very constant in all samples at 18-19 per cent. of the dry matter.

In digestion trials with sheep, excellent results were obtained, fully equal to those previously found with other greenstuffs. On the basis of these data, the dry matter of marrow stem kale represents a feeding-stuff of about 65 per cent. starch equivalent, including about 9½ per cent. of digestible "protein equivalent."

Another interesting point that comes out of the Cambridge data is the relative richness of the kales in mineral matters, especially lime, chlorine, potash and sulphur.

The leaf is the part richest in lime and sulphur, whilst the dry matter of the marrow is richer in phosphorus, potash, soda and magnesia. Clearly, the farmer who has a kale crop can make good use of it for remedying the defects of his hay supply.

Feeding of Diseased Potatoes. Another problem of the coming winter on many farms will be the disposal of potatoes affected with disease. These can be fed to live stock, but, if more than slightly affected, or if fed in large quantities, they should first be well boiled or steamed. It is advisable to throw away the water in which the cooking has taken place as this may contain deleterious ingredients, especially if the potatoes are badly affected. Storage of cooked potatoes is practicable if they are packed tightly in a pit silo and well trodden down. Potatoes so ensiled have been found to give as good results in pig-feeding as ordinary steamed potatoes, about 4½ lb. being equivalent in general feeding value to 1 lb. of cereal meal.

In using potatoes liberally in pig-feeding, their poverty in protein and minerals must be kept in mind, and allowed for in making up the meal supplement. Care must also be taken to avoid so raising the quantity of potatoes fed that the optimum amount of supplementary meal is not consumed. In

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the case of baconers, such excess would also probably lead to poor grading of the carcasses. Roughly speaking, the pig should take about one-third to one-quarter of a full allowance of meal and satisfy the rest of his appetite with potatoes given at two feeds daily. A common practice on the Continent is to give the pig a fixed daily allowance of about 1 lb. of a meal mixture containing 20-30 per cent. of protein concentrate, and leave the animal to satisfy its appetite on potatoes.

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Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	8 7	0 8	7 19	72	2 2	1.16	9.6
Barley, British feeding ..	6 7½	0 8	5 19	71	1 8	0.89	6.2
" Danubian	6 18	0 8	6 10	71	1 10	0.98	6.2
" Persian	6 5½	0 8	5 17	71	1 8	0.89	6.2
Oats, English, white ..	6 17	0 9	6 8	60	2 2	1.16	7.6
" " black & grey ..	6 17	0 9	6 8	60	2 2	1.16	7.6
" Scotch, white ..	8 7	0 9	7 18	60	2 8	1.43	7.6
" Canadian, No. 2 ..							
Western	8 10*	0 9	8 1	60	2 8	1.43	7.6
" Canadian,							
mixed feed	6 18	0 9	6 9	60	2 2	1.16	7.6
" Canadian,							
feed No. 1	7 8½	0 9	6 19	60	2 4	1.25	7.6
Maize, Argentine	6 2	0 7	5 15	78	1 6	0.80	7.6
" DanubianGal.Fox ..	6 3½	0 7	5 16	78	1 6	0.80	7.6
Peas, Japanese	18 12½	0 14	17 18	69	5 2	2.77	18.1
Milling Offals:—							
Bran, British	6 7	0 15	5 12	43	2 7	1.38	9.9
" broad	7 0	0 15	6 5	43	2 11	1.56	10
Middlings, fine, ..							
imported	6 17	0 12	6 5	69	1 10	0.98	12.1
Weatings†	7 2	0 13	6 9	56	2 4	1.25	10.7
" Superfine†	7 15	0 12	7 3	69	2 1	1.12	12.1
Pollards, imported ..	6 10	0 13	5 17	50	2 4	1.25	11
Meal, barley	8 5	0 8	7 17	71	2 3	1.20	6.2
" " grade II	7 10	0 8	7 2	71	2 0	1.07	6.2
" maize	6 12	0 7	6 5	78	1 7	0.85	7.6
" locust bean	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean	8 5	0 16	7 9	66	2 3	1.20	19.7
" fish	14 10	2 1	12 9	59	4 3	2.28	53
Maize, cooked, flaked ..	7 2	0 7	6 15	84	1 7	0.85	9.2
" gluten feed	6 5	0 12	5 13	76	1 6	0.80	19.2
Linseed cake—							
English, 12% oil ..	9 10	0 19	8 11	74	2 4	1.25	24.6
" 9% "	9 0	0 19	8 1	74	2 2	1.16	24.6
" 8% "	8 15	0 19	7 16	74	2 1	1.12	24.6

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Soya-bean cake, 5½% oil	£ s. 9 15§	£ s. 1 7	£ s. 8 8	69	s. d. 2 5	d. 1·29	% 36·9
Cottonseed cake, English, Egyptian seed, 4½% oil ..	5 10	0 17	4 13	42	2 3	1·20	17·3
Cottonseed cake, Egyptian 4½% oil ..	5 7	0 17	4 10	42	2 2	1·16	17·3
Cottonseed cake, decorticated, 7% oil..	7 17†	1 7	6 10	68	1 11	1·03	34·7
Cottonseed meal, decorticated, 7% oil..	7 17†	1 7	6 10	70	1 10	0·98	36·8
Coconut cake, 6% oil ..	6 15	0 17	5 18	77	1 6	0·80	16·4
Ground nut cake, decorticated, 6-7% oil	7 17†	1 6	6 11	73	1 10	0·98	41·3
Ground - nut cake, imported decorti- cated, 6-7% oil ..	8 2	1 6	6 16	73	1 10	0·98	41·3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 11	6 4	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil	6 12†	0 11	6 1	73	1 8	0·89	16·9
Palm-kernel meal, 1-2% oil	6 2	0 11	5 11	71	1 7	0·85	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	5 15	0 10	5 5	48	2 2	1·16	12·5
Brewers' grains, dried porter	5 7	0 10	4 17	48	2 0	1·07	12·5

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of September, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then, since its manurial value is 19s. per ton as shown above, the cost of food value per ton is £9 1s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N., 6s. 10d.; P₂O₅, 2s. 3d.; K₂O, 3s. 4d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	6 11
Maize	78	7·6	6 2
Decorticated ground-nut cake	73	41·3	7 19
„ cottonseed cake	68	34·7	7 17

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1·72 shillings, and per unit protein equivalent, 1·23 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

In accordance with the recommendation of this Committee the "food values" given in the following table may be taken as applicable to the ensuing four months, December to March, inclusive, for the purposes of advisory schemes in the rationing of dairy cows.

FARM VALUES.

Crops.	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Roots—			
Kohl Rabi	8	0·5	0 14
Mangolds	7	0·4	0 13
Potatoes	18	0·8	1 12
Swedes	7	0·7	0 13
Turnips	4	0·4	0 7
Green Foods—			
Cabbage, drumhead ..	7	0·9	0 13
„ open-leaved ..	9	1·5	0 17
Kale, marrow stem ..	9	1·3	0 17
Silage, vetch and oats ..	13	1·6	1 4
Hay—			
Clover hay	38	7·0	3 14
Lucerne hay	29	7·9	3 0
Meadow hay, poor ..	22	2·9	2 1
„ „ good ..	37	4·6	3 9
„ „ very good ..	48	7·8	4 12
Seeds hay	29	4·9	2 16
Straws—			
Barley straw	23	0·7	2 0
Bean straw	23	1·7	2 2
Oat straw	20	0·9	1 16
Wheat straw	13	0·1	1 2
Grains and seeds—			
Barley	71	6·2	6 10
Beans	66	19·7	6 18
Oats	60	7·6	5 13
Peas	69	18·1	7 1
Wheat	72	9·6	6 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

MISCELLANEOUS NOTES

Stud Goat Scheme

THIS Scheme, having for its object the improvement of the productive quality of milch goats kept by smallholders, cottagers and others of similar position, is being continued for the season 1936-37. For the current breeding season, which lasts till February 28 next, 101 stud goats have been registered and are standing at various centres throughout the country, including 11 in Wales, and their services are available for goats belonging to persons in the above-mentioned categories at a nominal fee, in no case exceeding 4s. Conditions of service and other information may be obtained from the County Agricultural Organizers at their respective County Education Offices, or from the Secretary of the British Goat Society, Roydon Road, Diss, Norfolk, which is responsible for the administration of the Scheme.

The report on the operation of the scheme during the season 1935-36 has now been issued. The Ministry's grant available for premiums was increased from £270 to £320, and thirty-seven counties were represented as compared with thirty-four in the previous season, Cardiganshire, Caermarthenshire, Devon, Flintshire, Merioneth and Westmorland re-entering the list. The number of goats accepted for registration increased from 76 to 92, classified as follows: British 23, British Saanen 20, Saanen 18, British Toggenburg 9, British Alpine 8, Anglo-Nubian 8 and Toggenburg 6. All the Saanens were descendants of those imported in 1922. The Secretary of the British Goat Society reports a growing interest in the Scheme on the part of cottagers and others who appreciate the improvement in their milking stock that is being effected by its means.

The Agricultural Index Number

THE September index of prices of agricultural produce at 127 (base 1911-13=100) is 8 points higher than that recorded for August and 6 points above the corresponding figure of a year ago. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number becomes 133.) The rise in the general index is attributable very largely to higher prices of milk, potatoes and barley,

MISCELLANEOUS NOTES

and, to a lesser extent, fat sheep and hay. Average prices of wheat, oats and fat cattle were lower than in August.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117
August	121	105	105	119	113	119
September	120	104	107	119	121	127
October	113	100	107	115	113	—
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January	—	111	119	124	125
February	—	110	117	122	123
March	—	106	112	119	122
April	—	109	116	126	129
May	—	105	116	117	120
June	—	104	114	117	121
July	—	104	117	120	121
August	108	108	122	120	124
September	108	111	125	128	133
October	104	112	121	120	—
November	105	113	120	119	—
December	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. At an average of 7s. 4d. per cwt., wheat showed a reduction on the month of 4d., but, owing to a rather larger fall having occurred during the base period, the index moves from 96 to 98. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration, the index is 130.) On account of the usual seasonal increase in the marketing of malting descriptions, barley at 10s. 4d. per cwt. was 2s. 9d. per cwt. more than a month earlier and the index rises by 24 points to 124. Oats at 6s. 7d. per cwt. compares with 6s. 10d. in August, but, with a similar fall in the base

MISCELLANEOUS NOTES

price, the index remains unchanged at 98. A year ago, wheat averaged 4s. 10d. per cwt., barley 10s. 1d. and oats 6s. 1d., the relative indices being 64, 121 and 90.

Live stock. Fat cattle prices continued to decline, and at 32s. 10d. per live cwt. the average for second quality was lower by 1s. 7d., the index moving from 102 to 98. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, brings the index up to 113. At an average of 9½d. per lb. for second quality, fat sheep sold at ½d. per lb. more than in the previous month, and the index rises by 3 points to 131. Baconers were unchanged both in price (11s. 5d. per score of 20 lb.) and index (111), while porkers averaged 11s. 10d. per score and showed a rise of 6d., the index advancing from 107 to 109.

Compared with August, dairy cows were slightly dearer, but, as a similar increase in price occurred during the base period, the index remains at 103. On the other hand, store cattle were cheaper and the index at 97 is lower by 4 points. Quotations for store sheep and pigs showed an increase, the respective indices moving from 126 to 132 and from 133 to 138.

Dairy and Poultry Produce. The increase of 2d. per gal. in the regional contract price of milk in September is reflected by a rise in the index of 27 to 202. Butter averaged 1s. 1¼d. per lb. as against 1s. 1d. in August, but as the upward movement was less pronounced than that recorded during the base years, the index declines from 100 to 98. Quotations for eggs rose from 14s 4d. to 14s. 9d. per 120, but here again the increase was less than during the corresponding months of 1911-13 and the index falls by 6 points to 124; at this level, however, it is still 5 points above a year ago. Cheese was slightly lower in price, and the index falls from 113 to 106. The September prices and indices for poultry were somewhat irregular; the combined index at 112 is, however, reduced by only 1 point.

Other Commodities. The potato index shows a rise of 40 points to 149 and compares with 147 for September, 1935. Average quotations for both descriptions of hay were higher, clover advancing from £4 14s. 6d. to £5 1s. per ton and meadow from £3 7s. to £3 14s. 6d. The combined index for hay at 105 is 7 points above that of the previous month. At 1s. 1d. per lb. wool rose in price by ½d., the index moving upwards from 95 to 100.

MISCELLANEOUS NOTES

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	Sept.	Sept.	June	July	Aug.	Sept.
Wheat	68	64	84	86	96	98
Barley	127	121	92	84	100	124
Oats	98	90	82	83	98	98
Fat cattle	104	94	98	100	102	98
„ sheep	124	114	131	128	128	131
Bacon pigs	102	93	119	113	111	111
Pork „	109	98	112	106	107	109
Eggs	103	119	114	123	130	124
Poultry	117	117	124	117	113	112
Milk	168	215	162	175	175	202
Butter	87	89	98	100	100	98
Cheese	94	78	108	113	113	106
Potatoes	158	147	160	139	109	149
Hay	104	95	83	82	98	105
Wool	87	89	94	94	95	100
Dairy cows	105	105	103	104	103	103
Store cattle	88	88	96	101	101	97
„ sheep	113	124	119	113	126	132
„ pigs	142	122	122	126	133	138

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	116	121*	115	112	122	130
Fat Cattle	119	109	111	114	117	113
General Index	125	128	121	121	124	133

* Superseding figures previously published.

Travelling Scholarship in Agriculture

THE Governors of the College of Estate Management have awarded a Travelling Scholarship in Agriculture to Mr. Claude Culpin, M.A., University Demonstrator in Agricultural Engineering at the School of Agriculture, Cambridge University. Mr. Culpin will be visiting Germany and America to investigate the application of power and machinery to agriculture.

Foot-and-Mouth Disease.—Four outbreaks of Foot-and-Mouth Disease have been confirmed at Upper Heyford, Oxfordshire, the first on October 11 and the last on October 18. The usual restrictions were imposed over an area of approximately 15 miles round the infected premises; and the disease position remaining satisfactory, the area was reduced to approximately five miles radius round the parish of Upper Heyford on October 26.

An outbreak was confirmed at Sealand, near Chester, on October 15.

APPOINTMENTS

and there have since been five other confirmed outbreaks in the same area, on October 17, 18 and 21 (two outbreaks), at Sealand, and, on October 20, at Churston Heath, Chester. Restrictions were imposed over an area of approximately 15 miles radius round Sealand on October 15 and no extensions of the area have been necessitated by the later outbreaks.

There were no further outbreaks in the Sussex Infected Area and the area was finally released from restrictions on September 28.

Enforcement of Minimum Rates of Wages.—During the month ending October 13, 1936, legal proceedings were taken against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed			Costs Allowed			Arrears of Wages ordered	No. of workers involved
		£	s.	d.	£	s.	d.		
Cheshire ..	Crewe ..	4	0	0	0	10	0	62 8 0	2
Devon ..	Hatherleigh ..	2	0	0	0	18	0	20 0 0	1
Gloucester ..	Cheltenham ..	12	0	0	0	12	6	44 13 9	2
„ ..	Chipping Sodbury ..	10	0	0	0	7	0	5 10 0	1
Kent ..	Tunbridge Wells ..	2	0	0	—			22 10 7	1
Lancs ..	Kirkham ..	9	0	0	0	3	0	15 0 0	3
Monmouth ..	Newport ..	3	0	0	3	0	0	44 0 0	3
Stafford ..	Leek ..	10	0	0	0	6	6	30 0 0	2
		52	0	0	5	17	0	244 2 4	15

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Berkshire : Miss G. V. Moore, N.D.D., has been appointed Assistant Dairying Instructor, *vice* Miss N. Taylor, N.D.D.

Cambridgeshire : Mr. W. S. Turner has been appointed Manager of the Egg-Laying Trials, *vice* Miss E. Moss.

Devonshire : Miss E. L. Coleman, N.D.D., has been appointed Assistant Dairying Instructor, *vice* Miss M. W. Earle, N.D.D.

Miss M. W. Earle, N.D.D., C.D.D., has been appointed Instructor in Domestic Science (Dairying and Poultry-keeping), *vice* Miss E. M. Bartle, B.Sc., N.D.D.

Dorset : Miss C. E. Day, N.D.P., has been appointed Assistant Manager of the Egg-laying Trials, *vice* Mr. P. Gale.

Durham : Miss M. D. Allan, N.D.P., has been appointed Poultry Instructor, *vice* Mr. H. Wignall, N.D.A., N.D.D.

Miss U. M. Heler, N.D.P., has been appointed Assistant Poultry Instructor, *vice* Miss M. D. Allan, N.D.P.

Essex : Mr. R. Robertson, N.D.A., N.D.D., has been appointed Assistant Lecturer in Agriculture.

Mr. F. C. Creyke, N.D.A., N.D.D., has been appointed Assistant Dairying Instructor, *vice* Mr. R. Robertson, N.D.A., N.D.D.

Mr. W. J. Lintin, N.D.P. (Hons.), has been appointed Assistant Instructor in Poultry-keeping, *vice* Mr. F. H. Jones.

WIRELESS TALKS TO FARMERS, NOVEMBER, 1936

Leicestershire : Miss U. A. Ridgway, N.D.D., B.D.F.D., has been appointed Dairying Instructor, *vice* Miss E. Pratt-Saddington.

Middlesex : Miss L. C. Style, N.D.H., has been appointed Assistant Horticultural Instructor.

Suffolk (East and West) : Mrs. E. T. Gregory, N.D.D., has been appointed Assistant Poultry Instructor.

WIRELESS TALKS TO FARMERS, NOVEMBER, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : November 2, 9, 16, 23 and 30	6.20	Mr. Anthony Hurd	For Farmers only.
Midland : November 12	6.40	Mr. W. B. Thompson	For Midland Farmers.
„ 26	6.40	Mr. W. B. Thompson and Mr. Anderson, an expert on beef	For Midland Farmers.
West : November 5	6.40	Messrs. A. W. Ling and John Tanner	For Western Farmers : The butcher's point of view.
„ 19	6.40	Mr. A. W. Ling	For Western Farmers.
„ 6	7.30	Mr. Reginald Arkell	Countryman Afield : Richard Jefferies and his Friends.
Scottish : November 3	6.20	Messrs. A. D. Buchanan Smith and William Bruce	Pigs and Bacon : a dis- cussion.
„ 6	8.30		The Everlasting Heri- tage : The Land in Cultivation.
„ 12	6.50	Mr. William J. Wright	For Scottish Farmers.
„ 19	6.40	Sir Robert Greig, M.C., LL.D.	What Research is Doing.
„ 20	8.25		The Everlasting Heri- tage : Town into Country.
Welsh : November 13	7.30	Mr. Moses Griffith and Prof. R. H. Thomas	Fruit Trees for Cultiva- tion in Wales.
„ 27	Not fixed	Messrs. Moses Griffith and S. B. Thomas	The Dairy Show in Lon- don.
North : November 6	6.40	Mr. N. C. McPherson	Gardening for Profit : Frames and Lettuces.
„ 13	6.40	Messrs. W. B. Mercer and A. N. Other	Late Potatoes.

* In the Scottish series "The Everlasting Heritage," the subject on November 6, at 8.30 p.m. will be "The Land in Cultivation," and the speakers include Mr. James Walker, of Fife, who is Chairman of a smallholders' association, and, as a contrast, Mr. John Mackie of Bent, Laurencekirk, who farms 700 acres entirely by mechanized methods. Other speakers will be Mr. J. B. Douglas, of Barstibly, Castle Douglas, who is a large dairy farmer, and Mr. James Ewen ; while Mr. Joseph Duncan will sum up the different views.

NOTICES OF BOOKS

† On November 20, in "Town into Country," there will be a discussion between the Townsman and Sir Robert Greig, on the chances a townsman has of making a living off the land. Sir Robert will call witnesses, including Miss Katherine Boyd, of the School of Rural Domestic Economy, Craibstone, Aberdeen, a smallholder from at own, and his wife, and a boy from Musselburgh who went to work on Mr. A. D. Buchanan Smith's farm at the age of eighteen.

NOTICES OF BOOKS

Humus: Origin, Chemical Composition and Importance in Nature.

By Professor Selman A. Waksman. Pp. xi+494. (London: Baillière, Tindall and Cox. 1936. Price 30s.)

Practical men have always regarded farmyard manure as the basis of soil fertility and, until a century ago, most agricultural writers treated humus literally as the food of plants. After the error of this view had been shown by the work of de Saussure and Boussingault, and driven home by the satire of Liebig, there was no clear reason for attaching great importance to the part played by organic matter in the economy of the soil. The field experiments, even at well-equipped stations such as Rothamsted, were concerned mainly with the inorganic plant foods, and the critics who maintained that artificial fertilizers alone were not enough, failed to establish the long-term trials needed to settle questions which have long been hotly debated. It is, of course, well known that farming is easier with abundant supplies of farmyard manure, but it is difficult if not impossible to assess the cost of this manure in different systems of farm management. Soil investigators have summarized empirical observations on the effects of humus in such statements as "it improves the physical properties of the soil," "provides a reservoir of slowly available plant foods," "smooths out seasonal irregularities," "provides energy for the micro-organisms," and "generally acts as a buffer in the widest sense of the term." They have established so many possible effects of farmyard manure in special circumstances—including such unexpected ones as the supply of small but essential amounts of copper or zinc—and related so many soil properties to the decomposition of plant residues that they are now, probably, more enthusiastic advocates of the importance of humus than the staunchest opponent of Liebig's mineral theory a century ago. They would, however, generally admit that the vast mass of laboratory work on humus and its decomposition has been of very little service in interpreting their empirical observations. They have abandoned the formulæ and methods of analyses which played so large a part in the textbooks and controversies of a few decades ago and they now treat the whole complex of organic materials in the soil as humus. For many purposes, they are content with determining the organic carbon and nitrogen, though many attempts are also being made to devise means of fractionating humus into such groups of compounds as cellulose, hemicelluloses, modified lignins and proteins. It appears that the essential constituents are complexes formed by the condensation of the lignin residues from plants with proteins from micro-organisms.

The main advances in our knowledge of humus have always come from some new development in one of the pure sciences, such as colloid chemistry and microbiology. At the moment, it appears that the most promising developments are to be expected from the youthful science of pedology. The maintenance of the soil humus must always remain one of the main objectives in permanent systems of agriculture, for most of the disastrous failures through drought, erosion, sand-drift, can be traced to systems of agricultural management which are so unsuited to the climatic conditions in that they interfere with the normal return of plant residues to the soil whilst intensifying the destructive processes.

NOTICES OF BOOKS

A detailed review of the history and present position of work on humus was particularly needed at the present time. No one could have undertaken it more usefully than Professor S. A. Waksman, who has made notable original contributions to the subject, and, in addition, has a unique familiarity with the literature of soil science in English, French, German and Russian. The scale of his monograph is shown by the fact that it includes a bibliography with the full titles and references of well over 1,300 papers. His historical summary is particularly valuable and should clear up much of the confusion which has resulted from the uncritical use of earlier work and methods. The central section on the origin and nature of humus will be useful to students and investigators, even though it emphasizes our ignorance. It should serve to check the unhappy combination of inadequate methods with dogmatic conclusions which has stultified so much effort in the past. The third section on the "Decomposition of Humus, its Functions and Application" is inevitably scrappy, but it suggests ways in which investigations in special fields can be related to the main problem of soil science and, indeed, to our knowledge of the most important source of human wealth. "Humus," says Thaer in a text quoted by Waksman on his title page, "is the product of living matter, and the source of it."

The Scientific Principles of Plant Protection, with Special Reference to Chemical Control. By Hubert Martin, D.Sc., F.I.C. Pp. xii + 379. (London: Edward Arnold & Co., 1936. Price 21s.).

The second edition of this well-known work is very welcome. In order to take account of the advances that have been made in all branches of the subject since the book first appeared, in 1928, the author has found it necessary to re-write completely almost every chapter, increasing the size of the book by some sixty pages, but the general plan remains unchanged. Students of economic entomology and mycology and, indeed, all interested in the protection of crops from pests and diseases, owe a considerable debt of gratitude to Dr. Martin for undertaking the laborious task of bringing his book up-to-date and making available a clear and carefully documented discussion of the very varied aspects of the subject; and the author's aim, as stated in his preface, to assist co-operation between biologists, chemists, and physicists in this wide field of work, will undoubtedly be amply achieved.

It is not necessary here to attempt to review the contents of the book in any detail. The theme of the main central section (Chapters V-XIII) is the physico-chemical factors and problems involved in the use of insecticides, fungicides and weed-killers. This is a field in which the author has himself made notable contributions, and his account is admirably done. There is also a particularly interesting discussion of recent progress in methods for the determination of toxicity to insects and fungi, and in the difficult study of the relationships between chemical constitution and toxicity; and other valuable chapters deal with plant resistance, the influence of external factors on the susceptibility of plants to attack by insects and fungi, biological control, methods of trapping insects and the treatment of the centres and vectors of infection.

The first edition of the work has proved its value, not only for the presentation of "principles," but as a reference book; the second edition more than maintains the standard then set and should add many new readers.

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NOTES FOR THE MONTH

The Imperial Fruit Show, 1936

THE 16th Imperial Fruit Show, held at Liverpool from October 30 to November 7, was as successful as the previous Shows held in the other populous centres of the country. It enjoyed the support of the Lord Mayor and Corporation and the active co-operation of the Liverpool Fruit Traders.

The entries of fruit sent for the competition classes were as numerous as ever—over two thousand packages of apples, pears and oranges from England, Canada, South Africa and Australia; over three thousand cans of fruit from the canneries of this country and other parts of the Empire; three thousand jars of honey; and numerous bottles of cider and pure fruit beverages.

The judges, who work in panels of three, do not pick out the exhibits which look the best, but award marks to every single exhibit. One panel examines and allots marks for the packing: another panel for colour: a third for freedom from blemish; and a fourth for quality and internal condition. The total maximum points are 100, and in this Show it is seldom that any exhibit wins a prize unless it receives 90 points, the best gaining 97 and 98. The marks by each panel are entered on a score card and are printed in the catalogue so that the exhibitors may learn of their weak and strong points. This proves of great educational interest to all exhibitors and to some visitors.

The following are a few of the chief awards:—

Class I.—Ten Boxes Dessert Apples (Open to the British Empire).

First Prize shared { *Miss M. B. Amos, Suffolk.*
 Messrs. W. Seabrook & Sons, Essex.

Class II.—Ten Boxes Culinary Apples (Open to the British Empire).

Mr. W. F. Gaskain, Kent.

The Champion Cup for English Dessert Apples.

Mr. Stuart Macdonald, Essex.

The Champion Cup for English Culinary Apples.

Mr. William Brice, Kent.

Dessert Apples. Many of the prizes for dessert apples were won by growers in the counties of Essex and Suffolk. The

NOTES FOR THE MONTH

winning apples were large, firm and full of juice, with particularly bright scarlets and reds on clear, golden-yellow skins. Evidently, the Essex growers have learnt the proper technique of applying fertilizers to the soil to produce just the fruit with the right texture, clear skins and brightness.

Culinary Apples. Among culinary varieties, the Kent growers were dominant and won many of the first prizes. These Kent apples were large in size, clear of skin and almost free of any pest damage. One or two exhibits of Edward VII were almost perfect in size, texture and colour.

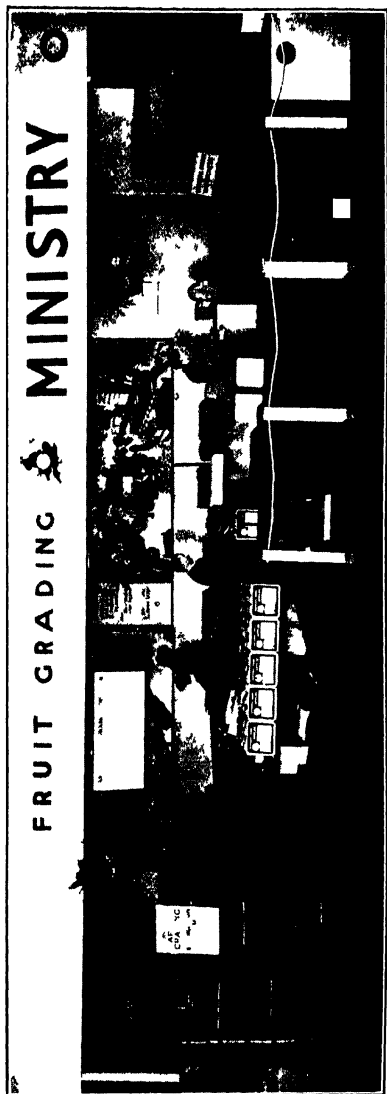
Generally, the colour and quality of all the apples were below normal owing to the wet summer, yet they were much freer from blemishes and pest damages than usual, which seems to suggest that the English growers are becoming more successful with their sprayings.

Canned Produce. The interest in the canning section continued, and this section created more interest amongst the Overseas canners than formerly. Australian canners were particularly interested in pears, peaches and apricots: South African canners in Cape Berries and Guavas; while the home growers exhibited many kinds of English fruit and vegetables.

The United Canners, Ltd., Lincs, secured most prizes in the canned produce section and so won the Silver Challenge Cup.

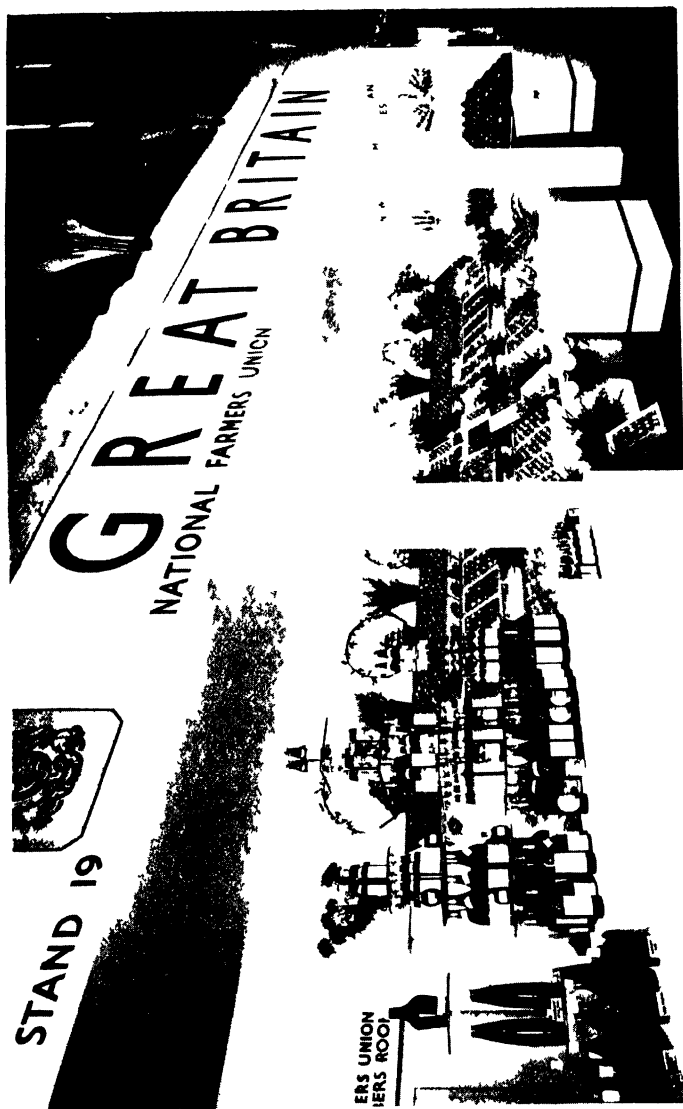
Fruit Beverages. Classes for cider have been included for several years. This year, classes were included for any Pure Fruit Beverages and these were very well supported. Ten firms competed with over fifty different exhibits. These comprised fruit syrups for use in the home, in milk bars and soda fountains: fruit juices and fruit squashes: aerated fruit beverages and fruit wines—all being prepared from pure fruit juice. The judges made fourteen awards of merit, seven of which were secured by Messrs. E. W. Carter & Co., Bristol. The raspberry, loganberry and cherry syrups reached a high standard and the aerated beverages from these were excellent drinks.

Surrounding the competition fruits were the stands proper. The Ministry of Agriculture demonstrated methods of fruit grading and packing to National Mark standards: Great Britain, Northern Ireland, Canada, South Africa, and Malaya had stands making attractive displays of the fruits and fruit products for which each country is famous, whilst there were numerous trade stands at which visitors were received and





STAND 19



FARMERS UNION
MEMBERS ROOM

GREAT BRITAIN
NATIONAL FARMERS UNION

The Imperial Fruit Show 1934
Stand of the National Farmers Union and the National Federation of Fruit and Potato Traders Ltd
(By courtesy of the Editor of *the Horticulturist*)

Photo Sec B I

NOTES FOR THE MONTH

business conducted. All the fruit experts and the canners gather at the Show to attend meetings and conventions, etc., so that the prevailing topic concerns fruit, its production and preservation.

The Show had much also to interest the public, and people crowded into the alleys and galleries in an almost continuous stream. They examined the wonderful stands of fruit, competed in the many competitions arranged for their amusement, and finally went home laden with a bag of "show fruits" purchased at a special stall at popular prices. The Liverpool people certainly became "fruit conscious" and so the Show fulfilled its object.

Investigations into the Causes of Blackening of Potatoes on Cooking

BLACKENING on cooking has an adverse effect on the marketing and consumption of potatoes, and although some research as to the cause has been undertaken previously, the results have been inconclusive. It is known that some varieties, such as the "King George," are more prone to blacken than others, and potatoes grown on certain soils, especially during wet summers, are liable to blacken on cooking. The cause, however, has still to be discovered.

The subject has engaged the attention of the Ministry and the Potato Marketing Board for some time, and the possibility of research into the question was discussed at a meeting recently held at the Ministry, at which representatives of the Potato Marketing Board and interested research workers were present. It was agreed that further research was desirable, and the Potato Marketing Board has decided to provide funds in order that a comprehensive investigation into the cause and remedy can be undertaken. Chemical and cooking tests will be carried out, and the relation of blackening to the nature of the soil, manuring, variety, source of seed, method of lifting and other factors will be studied. The Potato Marketing Board will arrange for the collection of potato samples on a large scale from all the important potato-growing centres of Great Britain. Cooking tests will be made in Messrs. Lyons' Laboratories, under the direction of Dr. Lampitt, while chemical tests on duplicate samples will be carried out at the Imperial College of Science and Technology under the direction of Professor V. H. Blackman. At this latter centre, the Board has also provided funds for

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the appointment of a bio-chemist to study the fundamental nature of blackening.

The statistical work in connexion with the investigation will be undertaken at Rothamsted Experimental Station, where a Conference, convened by the Ministry, and attended by the Regional Supervisors and representatives of the Executive Committee of the Potato Marketing Board, together with representatives of the Agricultural Research Council and of the centres participating in the work, was held on October 15 to discuss details of the field work and the questionnaire to be sent in with each sample. Mr. V. E. Wilkins of the Ministry presided, and addresses dealing with the problem of blackening, and the scope of the investigation, were given by Sir Daniel Hall, Professor Blackman, Dr. Lampitt, and Mr. Yates of Rothamsted. At the conclusion of the discussion, papers on the experimental work on potatoes that had been carried out at Rothamsted, were read by Dr. E. M. Crowther and Mr. Yates.

Latvian Clover

DURING the past nine years, the Latvian Ministry of Finance has issued a series of publications in various languages, dealing with economic questions concerning the Baltic states and Latvia in particular. The latest volume* contains an account of the reforms introduced by the Latvian Government since May 15, 1934, with special reference to the subject of exports. M. J. Steps, Director-General of the Central Society for the Exportation of Seeds, contributes an article entitled "La Lettonie: Pays des Semences de Qualité Supérieure," in which he recalls the fact that Latvia has long been known as a producing country for clover and timothy seed.

Every year, it is stated, Latvian clover seed is exported in more or less large quantities to various European countries, including Great Britain. During the season 1934-35, approximately 80,000 cwt. of red clover seed was exported, 20,000 cwt. of hybrid clover and 12,000 cwt. of timothy. Latvian clover yields a good hay crop and is luxuriant in growth, qualities that explain the heavy demand for seed from all parts of Europe. In addition, it is noteworthy that the Latvian clover does not contain the least trace of dodder.

* *L'Economiste Letton*, 1936. Edited by J. Bokalderis. Pp. 144. (Riga: Ministry of Finance.)

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Two varieties of red clover are cultivated in Latvia, viz., early-flowering and late-flowering, the latter being 10 to 20 per cent. dearer in foreign markets than the former, because it always yields a heavier crop of hay. In order to guarantee seed types, the Latvian Ministry of Agriculture has organized inspection of clover fields by its technical staff. In the recorded fields, the seed is harvested under supervision, cleaned, and to each sack is affixed the seal of the State Seed Control Station. In addition, on each sack is placed a label stating the type of clover within. Since the exportation of seed is entrusted exclusively to the Central Society for the Exportation of Latvian Seed, and is effected under State supervision, invariability of type is absolutely guaranteed.

The alsike clover of Latvia, like the red clover, is persistent and yields good crops. It has proved very hardy in wet conditions. For some years past, experiments with alsike clovers from different countries have been conducted in Finland. These experiments have established beyond all doubt that, with regard to yield and resistance, Latvian alsike clover can compare advantageously with that of Sweden. In Finland, a law has been enacted prohibiting the importation of alsike clover seed from all countries except Sweden and Latvia.

The cultivation of timothy for seed production has made considerable progress during the past four or five years. The best seeds of this plant are produced in Latgalia, and are remarkably hardy and very leafy, which explains the abundant crops of hay that they produce. The actual seeds are much larger than those produced in America or Western Europe. They contain few grains without husk, which determines their clear silvery tint and assures germination up to 90 per cent., in consequence of which their commercial value is much increased.

Industrial Fibres

FOR British farmers, wool is the most immediately interesting of textile fibres, but the incidence of other industrial fibres has an all-important bearing on the employment of wool.

Industrial Fibres, a review just issued by the Imperial Economic Committee,* indicates that most of the chief textile

* *Industrial Fibres*: A Summary of Figures of Production, Trade and Consumption relating to Cotton, Wool, Silk, Flax, Jute, Hemp and Rayon. Obtainable from Imperial Economic Committee, 2, Queen Anne's Gate, London, S.W.1. Price 2s. 6d., post free 2s. 9d.

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manufacturing countries of the world are conspicuously deficient in raw materials, and that only a comparatively small part of the production of natural fibres is utilized in the country of first production. Such fibres accordingly enter largely into the channels of international trade.

The review summarizes the figures of production, trade and, where possible, consumption of cotton, wool, silk, flax, hemp, jute and rayon during the past eight years, and indicates the more significant changes. In recent years, financial and economic difficulties have somewhat impeded the normal distribution of natural fibres. Further, there has been a marked development of secondary industries in such countries as China, India, Australia and Argentina, and a consequently reduced overseas market for the finished products of the older manufacturing countries. Indeed, the industrial development of Japan has been a factor of major importance in the changing world textile situation. In the period reviewed, Japan has not only retained its place as the world's chief supplier of raw silk, but has also become a large manufacturer of silk fabrics for export. At the same time, Japan has become the largest importer and the second largest consumer of raw cotton, and in eight years has more than doubled its consumption of wool.

An outstanding development during the period under review has been the increased production of rayon. World production in 1928 is estimated at 360 million lb., and, in 1935, at nearly 950 million lb. Rayon has definitely established itself as a textile fibre with marked characteristics and a widening sphere of utilization, illustrated by the recent adaptation of staple fibre for use on cotton and worsted machinery. The United States is the largest producer of rayon. Japan, where the development of the industry has been particularly marked, now takes second place; Italy provides nearly half the estimated production of staple fibre.

Consumption statistics in the chief manufacturing countries do not exist, so that the extent to which rayon has been substituted for other textile fibres remains problematical. On the one hand, the use of rayon in mixed goods has undoubtedly extended the range of textile products and widened the scope of utilization of cotton and wool. On the other hand, it has probably replaced natural fibres in certain branches of the hosiery industry, if not elsewhere. It is significant that three of the largest producers of rayon, Japan,

NOTES FOR THE MONTH

Italy and Germany, are particularly dependent on foreign sources of supply for their textile raw materials.

Bibliography of Literature on Agricultural Meteorology

THE Ministry has recently issued a second mimeographed Bibliography of Literature on Agricultural Meteorology in continuation of a previous work, on a more ambitious scale, which was published in 1932 and is now out of print. It is not claimed that the present bibliography is a complete reference to papers, etc., dealing with agricultural meteorology; it consists of the titles of those papers noted in the Ministry during the ordinary course of the administration of the Agricultural Meteorological Scheme from the perusal of the original periodicals, digests and other sources. The titles so noted between October, 1930, and the end of September, 1933, are included.

The bibliography has been widely circulated, both in this country, in India, and in the Dominions and Colonies. A few copies remain, and are available, gratis, to workers and others interested. Applications should be addressed to the Secretary, Agricultural Meteorological Committee, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1. It is hoped to issue a further bibliography, covering the period October, 1933, to September, 1936, at the end of the present year and thereafter at annual intervals.

Onion Growing in England

WITH reference to the article by Mr. A. H. Hoare, "Onion Growing in England: A New Commercial Method," published in this JOURNAL for July last, p. 333, Mr. David Kemp (Caversham) observes that he has grown onions in different parts of England and Scotland during the last 60 years, and considers that the results of the test mentioned by Mr. Hoare could be improved upon, especially as regards the individual size and weight of onions. Mr. Kemp has tried many varieties, and thinks that Sutton's "Solidity" is the best onion in cultivation for sowing in autumn and transplanting in spring, and the best-keeping variety that he has tried—some of the 1935 crop were in good condition in April, 1936. A strong point in its favour is its non-dolting quality: even the onions left in the autumn-sown bed to ripen did not show more than 4 per cent. of dolters.

The following particulars respecting crops of garden-grown

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onions, (i) autumn-sown and transplanted in spring, and (ii) spring-sown and thinned, may be of interest. It is held by Mr. Kemp that his method could be applied on the commercial scale. The variety in each instance was Sutton's "Solidity."

(i) *Autumn-sown*. Sown on August 8, 1935, in rows 12 in. apart; the soil was a thin layer of light soil over 6 to 10 ft. of gravel, with chalk below, and received no special treatment.

The soil into which the onions were transplanted received a good dressing of cow and pig manure, dug in during the first week of March, 1936, and the plants were put in the day after digging was completed (transplanting is usually done in February if weather conditions are favourable). The rows were 12 in. apart, and the plants 9 in. apart in some rows and 6 in. apart in others. The plants 9 in. apart made the larger bulbs, the general run being 1 lb. 4 oz. to 1 lb. 8 oz. Those 6 in. apart made smaller bulbs on the average, but gave a greater weight per row. For big bulbs, therefore, a distance of 9 in. is best; for weight of crop, 6 in.

After the first dressing of animal manure no fertilizer of any kind was given, nor was watering done. A small 4-tined fork was used to keep the ground clear and open during the growing period: a fork is preferred to any sort of hoe for this work, as about 1 in. of loose soil can be left as a mulch.

The bulbs were loosened in the soil with a fork the day before lifting; they were allowed to dry a day after being pulled up, and then tied in bundles of 8 to 10 bulbs and taken direct to a dry, airy, wooden shed, where they were hung on nails around the sides of the shed.

(ii) *Spring-sown*. The seed was sown during the last week of February, 1936, cultivation being the same as for the autumn-sown transplants. Plenty of bulbs weighed 12 oz. each, and harvesting was done at the same time and in the same manner as the autumn-sown crop.

The accompanying photograph illustrates the difference between medium bulbs of the two groups, exactly as harvested, and not considered good enough to grow on for seed.



Onion, Sutton's Solidity *Boule* Spring grown 1930 *Boule* sown 1935 transplanted 1936

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CLYDE HIGGS,

Hatton Rock, Stratford-on-Avon.

SAID a famous lady, in giving cookery instructions, "First catch your hare, then cook it"; and so with Tuberculin Tested (Certified) Milk production—first get your cows and then proceed to milk them. In discussing clean-milk production, far too little emphasis is usually laid on the cow, which is treated as secondary to elaborate buildings and equipment.

I keep Ayrshire cows because, in my early days, there was great difficulty in getting animals that were likely to pass the tuberculin test after six months. There are areas in Scotland free from tuberculosis, and herds that, having been tested for many years, show very few reactors. My herd has been self-contained for some years, and it is now very unusual to have a reactor.

There was at one time a great deal of trouble from contagious abortion. Vaccines having proved useless, I decided to rely on the blood test and dispose of reactors. It is an absolutely reliable method, but expensive, wearying and monotonous. The herd has been free for a long time, but the same precautions are still taken—general herd tests at regular intervals, calving in boxes and isolation until tested seven days after calving. It would be impossible to keep it up without the willing co-operation of the men.

Mastitis—most troublesome of all dairy diseases, because too little is known about it, and it is treated more or less as one of the necessary penalties of the dairy farmer—is effectively controlled by having quarter samples from each cow periodically examined by a research institute; and it seems only a question of a short time before it is eliminated. This, unfortunately, does not apply to summer mastitis, which, I think, is carried by flies and always results in the loss of the quarter; there appears to be no prevention or cure.

It is a remarkable fact that, having the major dairy diseases under control, there is very little trouble from minor ills. To have a cow off-colour is a very rare thing; usually, such trouble is confined to an odd case of stomachache. (Why does Nature mislead cows, as to the capacity of their insides?)

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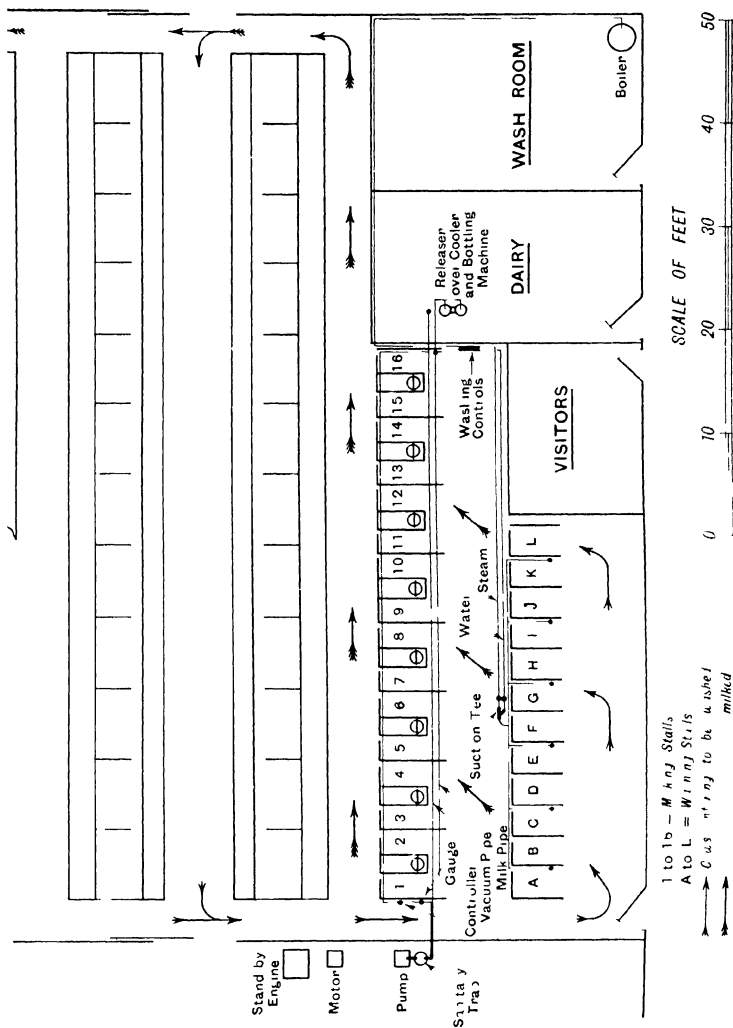
Having a healthy herd is only half the battle; to keep it so is the other. All the land is double fenced by running two strands of wire at least six feet from the boundary fences. This has disadvantages, as some neighbours treat the wire as the boundary, which means that I have to maintain both fences. Every ditch and pond is cut off, and even the river Avon; and drinking troughs supplied from known sources are fitted in each field. This may sound expensive, but if a mole plough is used to draw the pipe under the ground it is really very simple and cheap. Last spring, the cost of pulling a thousand yards of $\frac{3}{4}$ -in. piping 18 in. below ground was £4 10s.

My land consists of three farms—Hatton Rock, Spring, and Blacon; the two former adjoin, but Blacon is five miles away and makes a very good change for dry cows. The whole place is entirely devoted to the production of good milk and any other operation on the farm is secondary to it. I have found it most helpful to use each farm for a specific purpose—Hatton Rock for the milking herd; Spring for rearing young animals; and Blacon for calving and resting. Some time ago we milked and reared at two farms, but the difficulty of proper supervision was too great and the habit that cows have of calving at milking times disorganized the routine.

All the land is grass, and in grass drying, of which I have had considerable experience during the past two years, lies the future of dairying. The economical production of a home-grown food that will maintain a level yield of the highest quality milk is of the greatest importance to the dairy farmer. The problem is not yet solved, but we have made a start.

I have tried so far to give a general impression of my activities as a dairy farmer; but to give a better idea, perhaps, as to how I produce clean milk, it would be well to follow a cow from the cradle onwards.

Let us follow Cinderella—the cow that I use for advertising purposes, the cow that children who come to look round the farm invariably ask to see. Cinderella was born at Blacon, where her mother had been for about six weeks, resting from milk production; the benefit which the cows gain from the change in surroundings and soil is very marked. Her father is one of the three pedigree bulls I keep, all from heavy milking and high butter-fat strains. Ayrshires in my opinion are the finest dairy breed; their value when dead may not be so



1 to 16 — Milking Stalls
 A to L — Milking Stalls
 C to L — Milking Stalls to be washed
 C to L — Milking Stalls to be milked
 C to L — Milking Stalls to be returned from milking

FIG. 1.—Plan showing layout of Mr. Clyde Higgins (Dutch barn type) cowshed. Feeding stalls (top), milking stalls 1 to 16 (centre) with Alpha Iaval eight unit combine recorder installation and washing stalls (A to L) at bottom dairy and wash-room (bottom right).



FIG. 2. Exterior of Dutch barn type Cowshed



FIG. 3. Feeding Stalls with tubular vokes but no mangers or curbs

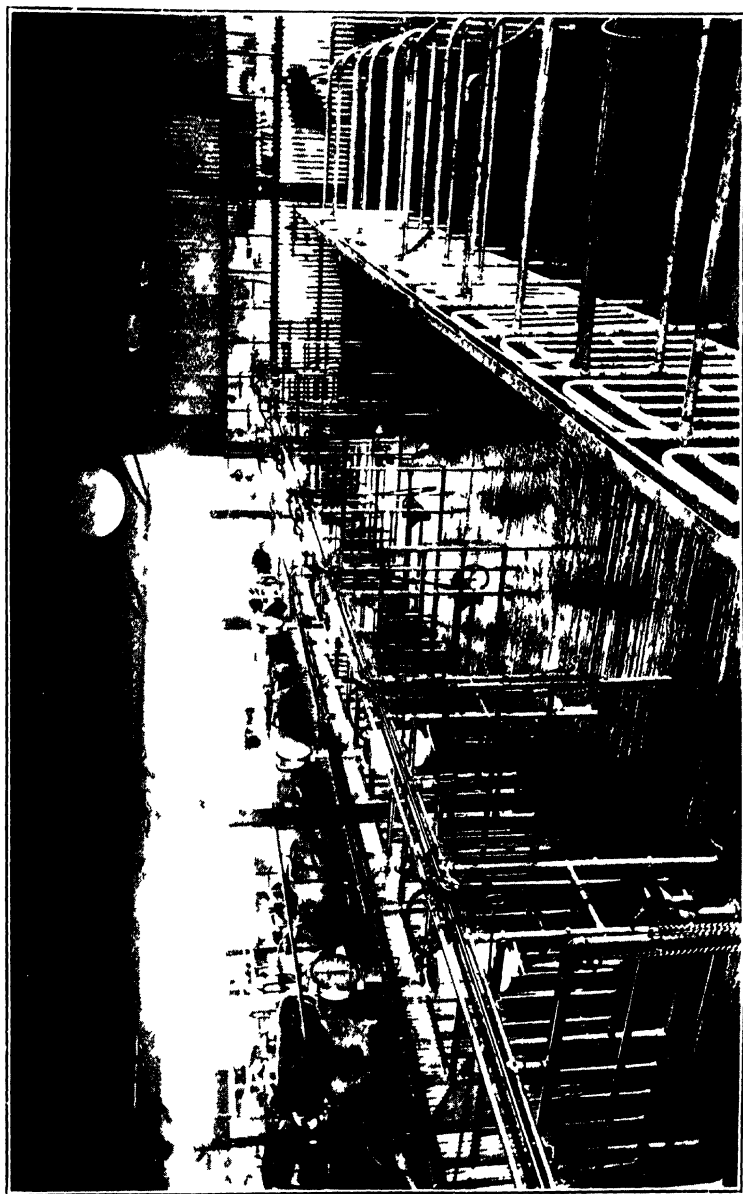


FIG. 4. General interior view of (left) washed looking towards the dairy, showing, within, stalls (right) milking stalls (center) and cows in feeding stalls.

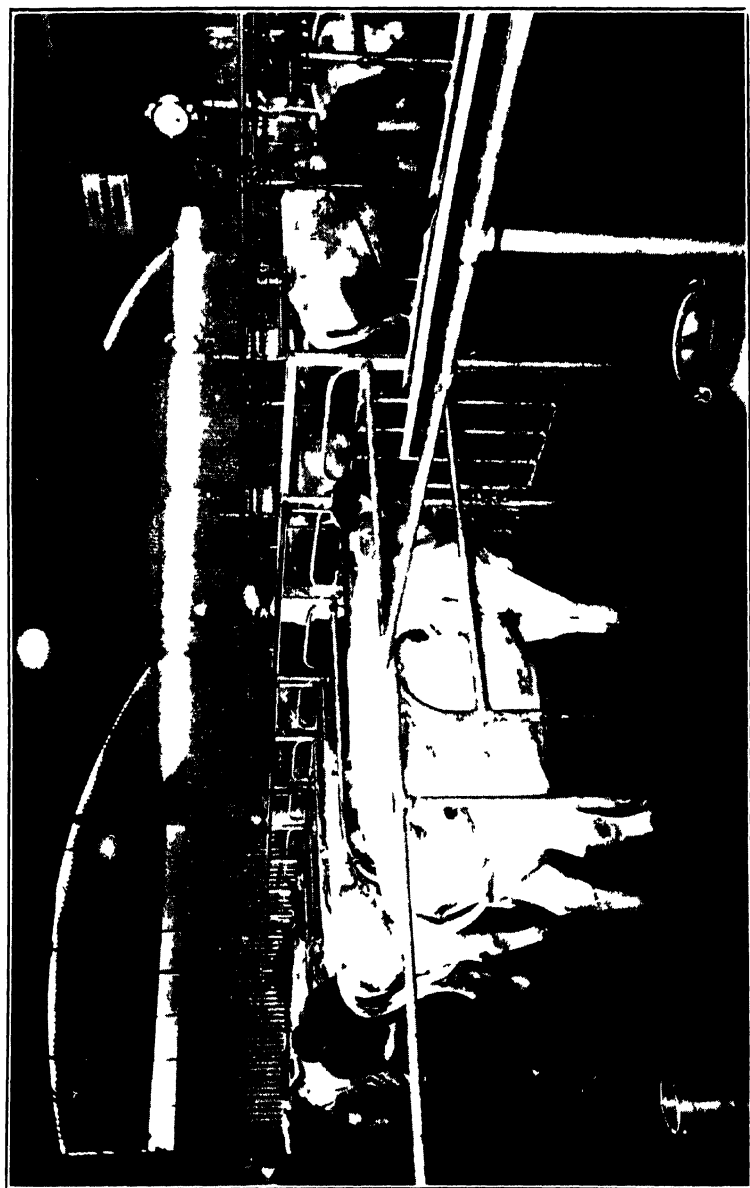


FIG. 5 — Interior view of Cowshed showing cows in washing stalls (foreground) and in milking stalls (beyond)

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high as that of dual-purpose animals, but a dairy cow is most profitable when alive. They are docile (I refer to the cows; the bulls, unfortunately, are most dangerous), hardy and economical to feed. The day after Cinderella was born, her horn buds were rubbed with caustic potash after being surrounded by vaseline. Thus, in later life, she will not be able to hurt her companions even in play. She stayed with her dam for six days and was then reared on a foster mother from among a few misfits and old friends that I keep for the purpose. When about four months old, she went to one of the open yards at Spring Farm with ten more or so calves of her own age. At a suitable time in the spring, after being inoculated for blackleg (I have never had a case, but the preventive measure is so simple that it seems wise to adopt it) she was turned out, and at eighteen months old returned to Blacon to be served as soon as possible by a young bull. After calving, she followed the same routine as her mother and left for the first of her milk production turns at Hatton Rock. If her calf was a bull, it went to the butcher at a standard price when three days old.

For the past two years, I have discontinued "steaming up," without any ill effects on the average milk yield, but with a reduction in the number of milk-fever cases and retained cleansings.

We try to get every cow served six weeks after calving, but, should she return to the bull, she is examined by the veterinary surgeon sometime before her next period; by making this a routine matter I have much reduced the percentage of dry cows.

All animals have access to a complete mineral mixture in powder form, served in large iron bowls, and replenished in small quantities so that it is always fresh. The young cattle consume a lot, but the older ones do not take so much interest in it.

Now to the important business of actual milk production at Hatton Rock. The shed there holds 144 cows, and some details may be of interest, as it was cheap to build and is efficient and economical in use. Previous to building it, nearly three years ago, I had spent, or rather wasted, a lot of money in adapting old buildings that were very expensive to run and difficult to supervise. The shed consists of four corrugated-iron Dutch barns side by side, two of which are shown in Fig. 1. The bays are 90 ft. by 30 ft. and three hold

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48 cows each, whilst the fourth houses the combine milker, washing stalls, cooling and bottling plant, boiler, etc. This plant could deal with three times as many cows as there are at present. Everything is visible from any point of the building, which is 11 ft. high to the eaves, the south gable ends being left open.

Looking first at the sleeping accommodation, each cow has her own stall, but there is one water bowl between two cows. Her name is written in chalk on the top rail of the iron work, with particulars of the rations against it. Tubular yokes are used, and, remembering that each cow is tied and untied ten times a day, no other fitting would be as convenient. There are no mangers or curbs—a most important point—for, after the cows have been milked, they are fond of wandering about before going to their own places, and if there were mangers there would be many accidents. The lack of curbs has justified itself by the total absence of big knees, and the cows lie down in their natural position with the feet stretched out in front of them—a sight that must be seen to be believed. There is no difficulty in feeding hay or dried grass, and concentrates are served by a home-designed machine which gives the ration for 1 gal. by a turn of the handle. One man feeds 144 cows with cake in ten minutes. Baled straw is used liberally for bedding all the year round, for the grass land absorbs an unlimited quantity of farmyard manure. One row of stalls is properly cleaned each day and the ironwork washed with hot soda-water.

The cows always lie in at night, as, with three times milking, finishing at 10.30 p.m., it is not worth disturbing them. Here, perhaps, I may refer to the three-times-milking question. It is a lot of trouble—most work is. Where the farming is mixed, with a few cows fitted into the general run of things, it is certainly not advisable; neither does it seem practical to milk some of the herd twice and some three times, for, to do justice to both sections, it means four milking-times a day. On specialized dairy farms, however, particularly where milk is retailed, it is without doubt the proper system. To the consumer, it gives a level cream content irrespective of the particular milking at which the milk is produced. It enables the farmer to have two-thirds of his milk ready for early dispatch; the yields are higher; and the cow benefits, perhaps, most of all, for she is never struggling along with a distended udder and she is fed oftener and in smaller quantities. In the

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hot weather, she is housed during the most trying part of the day.

It means careful organization of labour, and, of course, the cowmen do no other farm work, being responsible only for milking, feeding the cows and cleaning the shed. For my cows, I have nine men, and one is off each day, except Sunday, when the extra help enables the work to be finished earlier. The head man takes his day off like the others. Milking times are 5.0 a.m., 1.0 p.m. and 9.0 p.m. At the morning and midday milkings there are six men, and at night five. The men work two milkings a day, and the shifts are changed each Sunday. In the morning, one man brings the cows from their sleeping quarters to the washing pen; two men wash the cows; two men milk, and one starts getting the manure out of the shed. This is done with pneumatic-tyred barrows; these are pushed up a ramp and the manure is tipped into a cart. The bury is about 500 yards away from the buildings, and is left to rot for twelve months before use. The labour at the other milkings is the same, except that no cleaning out of the shed is done.

The plan (Fig. 1) covers the most interesting half of the shed. The arrows show the track of the cows from their sleeping quarters to be washed and milked and home again. It is all one-way traffic, and if only human beings would obey road instructions in the way that the cows follow the arrows, accidents would be much reduced! On arrival in stalls A-L they are washed with warm water, which is laid on to each stall and is heated by an injector connected to the boiler in the wash room. After the cows are dried with a cloth—which is disinfected after use for each cow—the fore milk is drawn on to the floor. An important point here is that the floor of the washing pens is dished under the cows' udders, so that the washers are standing in the dry and the dirty water and fore milk go straight away to the drain. An indicator shows the milker which cows are washed, and he opens the gates as required. There are sixteen milking stands, and the twelve washing-stalls keep them comfortably filled. The cows are never fed whilst being milked.

The combine system of milking is, I think, as great an improvement on machine-milking as this is over hand-milking. It is cleaner and quicker than the bucket type and leaves the cow with a dry bed to lie on. The milk is weighed in the glass container whilst she is being milked, and recorded.

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On these totals, the rations for the following week are based. As soon as the milking is finished, the machine is flooded first with cold water, then with hot water, and finally steam-sterilized.

When the milk reaches the dairy it comes under the care of the dairyman. It goes by gravity over a direct-expansion cooler into a filling machine, then into the bottles, and so to the cold store. The filling machine is only a simple two-head one, but it bottles the milk quickly enough to keep pace with the milking.

The dairy work is also done in shifts by seven men. One is head dairyman; five have a van each for delivery; one is spare, taking the place of each of the others in turn on their day off. The milk is only delivered once daily, so that the drivers take one midday and one evening dairy-duty each week.

In the wash room is the coke-fired boiler with a single-cross tube. It is well lagged with asbestos and the fire never goes out except through carelessness. The water is very hard, but the boiler is kept in good condition by putting half a pint of boiler enamel in the feed tank each day. There are two sterilizing chests, two washing-up tanks, and a bottle-washing machine. This last is of the brush type with a large rotary soaking tank. I had a small hydro plant that certainly saved a lot of labour, but never washed a bottle clean. As soon as the roundsmen return, they join in washing the bottles; and, on a two-brush machine, can do 1,500 an hour, these being afterwards sterilized in the chests.

The plant is electrically driven, two-horse-power motors being used for everything. In some cases they are larger than necessary, but the interchangeability in case of breakdown is a great asset. As the electricity occasionally fails, there are standby engines that are run each week to ensure that they are in working order.

The water supply at Hatton Rock comes from an unfailing and perfect spring 700 yards away. A slow running 3-in. single-cylinder, double-acting pump lifts the water against a head of 150 feet. Cows cannot make milk without water, and, to guard against failure of the supply, there are two pumps, two motors and an engine.

Five Austin vans deliver the milk, and are away by 6.30 a.m. each morning. The rounds average from 30 to 40 miles a day. Customers are always attracted by a well-



FIG. 1. Interior of the Dairy showing direct expansion cooler and filling machine.



FIG. 7. The Full flyround



FIG. 8. Laying water pipes with a mole plough

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kept van, and I find that the cheapest way of keeping mine up to the mark is by exchanging them when they have done 20,000 miles.

A sample of milk is taken at each milking and tested for *B. coli*. Until recently, plate counts were carried out, but we are now changing over to the Methylene Blue test.

To run a substantial retail round efficiently entails office work, but this should be kept as light as possible. I have a dread of the usual type of milk book that the customer can never find and that always has an unhealthy smell, so I designed a system of my own, and it has worked very well for ten years. We have loose-leaf ledgers measuring 24 in. by 15 in., and each customer has three sheets in them. The first is divided into twenty-eight squares in four rows of seven—one for each day of four weeks. The second is a yellow sheet divided into four with the days of the week on each, and the third a white sheet for the office copy. At the beginning of the week, the office staff make out the small tickets with the customers' probable requirements, which go through to the yellow and office copy by carbon paper. Each day the appropriate tickets are torn out, tied together and counted to make a round book for the driver. Should the customers delivery differ from the forecast, it is noted in a book which also contains receipts and order forms for cream, etc., a different colour for each round. On Friday midday, the books are closed, the bills totalled, the sales, receipts and debtors balanced so that the financial position can be gauged at any time. The bills go out with the vans on Mondays. Little trouble is experienced with bad debts, because I never let a new customer owe more than a fortnight unless proper arrangements have been made. Some take offence at being asked for money—usually because they have not got it!

With all this care in production, it might be thought that the milk would sell itself—far from it! It is only by constant advertising that we are able to increase our sales as becomes a prosperous business. The prices are modest, too much so, I am often told, but they leave a reasonable profit. For Tuberculin Tested Certified Milk, 7d. a quart in the summer 7½d. in the winter. Pints are 4d. all the year round. The difference in the pint and quart bottles is to encourage people to buy their whole supplies from me rather than to take a pint for the baby until it grows up and return immediately afterwards to their old milkman.

MILK : REPORT OF REORGANIZATION COMMISSION FOR GREAT BRITAIN

THE Report of the Reorganization Commission for Milk for Great Britain* has just been published as No. 44 of the series of Orange Books on Agricultural Marketing:

The Commission was appointed jointly by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland on February 11, 1935. Mr. A. E. Cutforth, a former President of the Institute of Chartered Accountants and a member of the previous Milk Reorganization Commission (for England and Wales), was Chairman. The other members were Professor A. W. Ashby, Professor of Agricultural Economics, University of Wales, Aberystwyth, who had also served on the earlier Commission, Sir Iain Colquhoun, Sir John Orr, and Miss D. S. Tomkinson, Chairman of Western Federation of Women's Institutes. The terms of reference of the Commission required them to examine the working and effects over the past three years of organized milk marketing in Great Britain, and to make recommendations for further improvement. They were also asked to consider whether it was desirable to provide for closer co-operation between the several schemes, or for amalgamation or other adjustments, and, if so, to suggest the changes that should be made; and to report on the question of closer co-operation between the Milk Marketing Boards in Great Britain and the appropriate authorities in Northern Ireland.

As the Commission point out in an introduction, they have, at the invitation of Ministers, interpreted their terms of reference liberally. Their proposals would entail important changes of principle in the organization of milk marketing, and new legislation would be required to give them effect.

The Report is in four parts, consisting respectively of a short account of the four schemes; an appraisal of their effects; a discussion of certain fundamental principles involved in the organization of milk marketing; and the Commission's recommendations for the future. It is unanimous, but is followed by a short Addendum signed by Sir John Orr.

The survey of the schemes and their effects contained in Parts I and II, leads the Commission to the general conclu-

* *Milk : Report of the Reorganization Commission for Great Britain.* Published by His Majesty's Stationery Office as Economic Series No. 44, price 1s. net, or 1s. 5d. post free.

REPORT OF THE MILK REORGANIZATION COMMISSION

sions that the schemes have been of great value to milk producers and to agriculture as a whole; that distributors as a body have benefited; that manufacturers of milk products have not been adversely affected; and that the cost of the advantages gained has been borne by consumers in the form of higher prices for liquid milk, although they, too, may in the long run gain by the stability given to the milk market, as they have certainly gained from the low prices ruling for milk products in recent years. One interesting point made is that the increase in the volume of milk sold since the schemes came into operation is apparently not due to any abnormal increase in production.

In discussing the broader issues raised by the schemes, the Commission express the view that the chief objects of organized milk marketing should be to ensure equity between all sections of producers and between all the interests concerned in the milk industry; to secure that milk is produced and distributed efficiently and economically; and to increase the consumption of liquid milk, especially among those sections of the population that need it most.

At present the prices paid by wholesale buyers, and thus the prices received by producers, are determined by the decisions of Boards consisting, for the most part, of elected representatives of producers. The Commission suggest that this arrangement, even with the statutory safeguards, is not calculated to assure buyers and consumers, or even particular sections of producers, that their interests are sufficiently considered. It is also urged that elected producers' Boards may be deterred from encouraging progress towards more efficient production in cases where this might adversely affect existing interests; and, further, that they would not be a suitable agency for developing improvements in distribution.

The Report recognizes that the producers' Boards are fully aware of the need for increasing the consumption of liquid milk, and pays a tribute to their collaboration in publicity schemes and in the supply of cheap milk to school children. It points out, however, that the immediate financial interest of producers may well lie in raising liquid milk prices in the ordinary market. The pressure to raise liquid milk prices, it is suggested, must constitute a serious and even an increasing risk, so long as the value of manufacturing milk remains at current low levels, and so long as the volume of milk marketed tends to increase.

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The Report discusses the various policies that have been advocated to deal with the situation created by an output of milk considerably in excess of the current demand for liquid milk. The Commission do not favour the plan by which basic shares in the remunerative liquid-milk market would be allocated among producers; and, while they make no recommendations regarding import policy, they point out the limitations as well as the possibilities of quantitative regulation, increased import duties and the levy-subsidy systems.

The Commission's proposals are based on certain broad principles. The first is that price control should be used as an instrument for promoting a planned policy for the milk industry in the interests of producers and of the community as a whole. The second is that, as price is the vital factor influencing production, distribution, manufacture and consumption, the control of prices should rest in impartial hands, and not in those of one of the interested parties. Thirdly, the producers' Boards should be retained as an integral part of the new system, since they have proved their efficiency as administrators and as representatives of producers.

The Report recommends that the new organization of the industry should include the establishment of a permanent Milk Commission, consisting of five members appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, after consultation with the Departments responsible for other interests. Its chief duties would be to assist the Government by planning a milk-production policy adjusted to the nation's needs, by supervising the implementation of that policy, and by framing measures designed to increase the consumption of liquid milk. In formulating policy the Commission would consult with, and assemble information from, producers', distributors', and manufacturers' organizations. It would report annually to Parliament through the appointing Ministers, and would submit recommendations to the Government when called upon to do so or on its own initiative.

It is proposed that the English Milk Marketing Board should be retained in much the same form as at present. A single Board is recommended for the whole of Scotland in place of the three existing and two projected Boards; but Scotland would be divided into regions analogous to those in England and Wales. The two Boards would retain all executive and administrative functions exercised by the present Boards,

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except that of determining prices; and they would be under a statutory obligation to enforce, through their terms of contract, the prices fixed by the permanent Commission. They would also assist the Commission with their advice and with statistical and other information.

Other recommendations affecting the constitution of the marketing Boards include reforms in electoral procedure, of which the chief are the introduction of postal voting instead of proxy voting; the co-option instead of election of special members of Boards; the substitution of regional general meetings and a central delegate meeting for the present system of general meetings of all producers; and the creation of producer-retailers' advisory committees.

Proposals are also made for more closely co-ordinating the various interests concerned in the milk market, including the establishment of a Standing Co-ordination Committee, consisting of representatives of the two Boards and of Northern Ireland with an independent Chairman.

The price system recommended differs in certain important respects from the present arrangements. The prices payable to producers as well as the prices paid by wholesale buyers would be fixed in advance for each yearly contract period. Producers' prices would thus be firm prices; they would be subject to no deduction, except in respect of transport, and they would be payable for the entire output offered for sale. The permanent Commission would fix these prices at such levels as, according to its calculations, would bring into the market the quantities of milk required, suitable differences being prescribed according to the quality of the milk and the season and region of its production. As a result, each producer would be able to tell in advance exactly what price he would receive for each gallon of milk of a given quality produced in each month, and could plan his production accordingly. It is contended that this added security would be of great benefit to producers.

The volume of production to be aimed at would necessarily depend on the volume of milk expected to be sold respectively for liquid consumption and for manufacture, and on the unit returns to be expected from such sales, together with any financial assistance that might be available from the Exchequer. Thus, the permanent Commission, in determining prices, would have to make careful estimates with regard to certain variable factors. The Report claims that it should

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be possible to forecast and balance annual income and expenditure within a fairly small margin of error; but it recommends either that provision should be made for a reserve fund, or that the State should guarantee temporary overdrafts, which could be met by price adjustments for the ensuing year.

The price policy which the Report recommends is based upon the principle that liquid milk should be made as cheap as possible; but it is not proposed to fix prices, to producers, that would reduce the present volume of production. The ordinary wholesale price of liquid milk would consist of the producer's price, plus an addition representing the loss incurred in the disposal of the milk that can fairly be regarded as the reserve required to maintain a steady supply to the liquid market; this is tentatively estimated at 20 per cent. of the amount actually consumed. It is recommended that the loss in disposing of any remaining supply should be a charge upon the State. This, together with the proposal that retail prices should, in general, no longer be regulated by the terms of the Boards' contracts, should lead to some reduction in prices.

In addition to these concessions to the ordinary purchaser of liquid milk, the Report recommends that the permanent Commission should institute further experiments, comparable with the Milk-in-Schools Scheme, for the sale of milk at specially reduced prices to sections of the population whose consumption is low. Certain general suggestions are made as to the lines upon which these experiments might be based. It is recommended that the State should subsidize schemes for "assisted price" milk as a matter of social policy.

As regards prices for manufacturing milk, the Report recommends that the present system of charging according to the value of the final product should be retained, and that wherever possible prices should be fixed on the basis of a formula relating to the current price of the product. Slight adjustments might be made in order to encourage the production of the commodities returning the highest values for the milk used in them.

As regards variations in producers' prices, the Report suggests that these should be fixed with the ultimate object in view of securing the greatest efficiency and economy in production; and it is recommended that regional variations should be designed to encourage the production of milk where

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it can most cheaply be produced, having due regard to the costs of transport. Seasonal price variations should take account of the costs of manufacture as well as of production. It is recommended that changes in the levels of prices should be made gradually, so that there would be no sudden changes in the location of production.

In order to raise the quality of milk, it is proposed to establish a system of standard grades covering all sales; the minimum standard that may be sold for liquid consumption should gradually be raised. Each producer should be paid for his milk according to its quality, whether or not all milk of the higher grades could be sold at higher prices. Recommendations are also made regarding level delivery and other special service premiums, and the assessment of producer-retailers' contributions.

As regards the transport of milk, it is proposed that the Boards should operate a system of pooled transport charges. This would enable the Boards to reduce costs by cutting down unnecessary transport and also to allocate transport charges more equitably among producers. A general outline of a system of pooling on the basis of zones surrounding consuming centres is put forward, but the details are left to the Boards to settle.

With regard to distribution, the Commission's proposals are less specific, but the Report expresses the conviction that substantial economies could be secured through the reorganization of distribution. In particular, the need for concentrating urban supplies in wholesale depots, and for various improvements in retail organization, is emphasized. It is recommended that the permanent Commission should conduct a detailed investigation into the whole question of the organization of the milk supply service and submit a Report.

In his Addendum, Sir John Orr emphasizes the importance of increasing milk consumption, and, while he recognizes that the proposals made in the main Report (which he has signed) are "an important step in the right direction," he recommends that the permanent Commission should be required to submit a special report to the Government, after two years, showing how far the public-health objectives have been achieved and what further changes, if any, are necessary in the public interest.

COMMERCIAL FRUIT-SPRAYING DEMONSTRATION IN WEST NORFOLK

J. TURNBULL,

Ministry of Agriculture and Fisheries.

A SERIES of spraying demonstrations, covering the 1935-36 season's programme, was carried out in co-operation with Messrs. H. Goude (then Horticultural Superintendent to the Norfolk County Council), E. Skillman, his assistant, and J. E. Spickernell of the Ministry. The object was to demonstrate how thoroughness in spraying can be achieved easily and rapidly by using higher pressure and short lances fitted with double nozzles, giving a fine driving spray of long range, as designed by the writer and described in this JOURNAL for August, 1934.

Mr. A. Image, of Oxburgh Hall, near Wisbech, kindly placed at our disposal a 10-acre plantation of Bramley and Emneth apples, which he said had never cropped satisfactorily, together with his staff, spraying plant and the necessary materials. Three acres had Careless gooseberries between the trees and the remainder had no undercrops.

The plantation had received potash for several years and the trees looked poor. Five cwt. per acre of sulphate of ammonia or nitro-chalk were given, and part of the land was ploughed in February.

The spraying plant consisted of a $3\frac{1}{2}$ h.p. Demon outfit, 13 years old, equipped with water pump, mixing and spraying tanks. When in good working order, it was found capable of delivering $7\frac{1}{2}$ gal. per min. at a pressure of 400 lb. per sq. in. The delivery pipes consisted of about 450 ft. of $1\frac{3}{8}$ -in. portable mains with brass couplings and $\frac{1}{2}$ -in. rubber hoses, each 300 ft. long; and 4-ft. wooden-handled lances, fitted with double nozzles, giving the required type of spray, were used. The sizes of discs tried, as measured in sixty-fourths of an inch, were $4\frac{1}{2}$, 5 and $5\frac{1}{2}$,* giving an output from each double nozzle of 2.2, 2.7 and 3.5 gal. per min. respectively, at a pressure *at the nozzle* of 300 lb. per sq. in.

* It was agreed at a conference of spraying machinery manufacturers held at the Ministry in May, to adopt this method of numbering discs as standard.

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The capacity of the pump was sufficient to carry three double nozzles of the first size, but only two of either of the others.

Tar Oil. No information was available as to the pests present and it was decided to spray with standard tar oil at $7\frac{1}{2}$ per cent. (3 in 40). A start was made on December 17, but only 2 hours' spraying was done that day, owing to frost. Later, 4 hours' and 2 hours' work were done on other days. Many delays were caused by loss of pressure and blocked nozzles, due to last year's spray deposit in the pipes and hoses. One man mixing, two boys pulling hoses, three men spraying, did $3\frac{1}{2}$ acres with 1,600 gal. in the 8 hours. Size No. $4\frac{1}{2}$ discs were used. The pressure at the pump was generally 350 lb. per sq. in., but probably not more than 250 at the nozzles. The rest of the plantation, except four rows, was sprayed by Mr. Image in January with the usual long lances.

Petroleum. This spraying was commenced on March 24, to allow an interval, supposed to be necessary before the next spray. Petroleum emulsion was used at 5 per cent. (2 in 40). One man mixing, two boys pulling hoses and two men spraying, with the same discs and pressure as for the tar oil, did $3\frac{1}{2}$ acres with 1,160 gal. in 5 hr. Later, $5\frac{1}{2}$ acres were sprayed with 2,040 gal. in 9 hr. Two rows that had received tar oil and two rows that had not were not sprayed. Thus there were two rows that had received tar oil and no petroleum, two rows that had received petroleum and no tar oil, and two rows that had not been sprayed.

Green Flower. In April, extensive markings by Apple Blossom Weevil, and, on the unsprayed trees, a fair number of buds bored by Tortrix caterpillars were found. On April 15, lime-sulphur at 3 per cent. ($1\frac{1}{3}$ in 40) was used, the start being delayed by rain. By this time the plant was working well, but the freshly-ploughed ground made the work difficult. One man mixing, three hose-pullers, three men spraying, did the whole 10 acres with 2,560 gal. in $7\frac{1}{4}$ hr.

Pink Bud. On May 5, the unsprayed trees showed Weevil and Tortrix marks as before. Very few Capsids were seen and these were in the first stage. No Capsid and many fewer insect markings were found on the sprayed trees. No Scab was seen. A spray consisting of lime-sulphur $2\frac{1}{2}$ per cent. (1 in 40), lead arsenate paste 5 lb. (2 lb. in 40) and

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spreader 10 oz. (4 oz. in 40 gal.) was applied. The lime-sulphur was reduced to half-strength over the gooseberries. An attempt to use the largest discs (size 5½) failed, because the pressure at the nozzles dropped and the spray would not reach the tree tops. The pressure at the pump remained constant, therefore the loss was due to the fact that the very long hoses would not carry the increased quantity required by each nozzle, without an excessive loss (200 or 250 lb.) of pressure. Size 5 discs were then fitted and gave a better spray than size 4½, but the pump would not carry three double-nozzles fitted with them. One man mixing, two boys hose-pulling and two men spraying, did the whole 10 acres (except six trees) in 10¾ hr. with 2,660 gal.

Petal Fall. On May 26 it was seen that the Apple Blossom Weevil had done little damage, but it was decided to commence banding at once, to reduce the attack next season. On the unsprayed trees were found many Tortrix caterpillars, a fair amount of Capsid on the Emneth, very few on the Bramleys. There was a fair amount of Red Spider and some eggs on both varieties and a trace of Scab on Bramleys. No Capsid and no Red Spider were found after tar oil and petroleum, but a few Capsid on the Emneths after petroleum and no tar oil. There were still some Tortrix caterpillars on the sprayed trees. No sawfly scars were seen. It was decided to spray with lime-sulphur at 1 per cent. ($\frac{2}{5}$ in 40), but spreader was added at Mr. Image's request. Nicotine and arsenate were added for the rows not sprayed with tar oil and petroleum, to reduce the "carry over" of insects. The Emneths over the gooseberries were not sprayed.

The pump pressure was raised to over 400 lb. per sq. in. and it was estimated that there was 300 lb. at the nozzles. One man mixing, three hose-pullers, three men spraying, did the first 5 acres with 1,080 gal. in 3½ hr. The remainder of the piece was sprayed in various ways owing to the treatment of the unsprayed trees, and the costs of these are omitted, as being no part of the original programme. No spray damage followed any of these applications.

Dusting. It was not convenient to do any more wet spraying, but it was decided to dust against Scab. The weather during May had been unfavourable to the development of the Scab fungus, but conditions changed late in the

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month. June was very unsettled and July was very wet, and Scab became rampant on the unsprayed Bramleys. Mr. Image made three applications of dust on June 19, July 3 and 18—the dates being later than intended, owing to adverse weather conditions. A copper-lime dust (actually a Bordeaux dust) used on 4 acres, and, on each occasion, one man leading the horse and one man dusting, took 2 hr., using 125 lb. The remaining 6 acres were done with sulphur dust.

On July 28 it was found that the copper-lime-dust had caused russetting on the Bramleys, but not on the Emneths. The fruit dusted with sulphur was very bright. The leaves on the non-fruiting spurs were in very fair condition and the manuring and cultivation had not proved excessive, in spite of the wet summer. On the trees that had only received lime-sulphur at mid-April, the Bramleys were 25 to 30 per cent. scabbed, but the Emneths only 10 per cent. and that very lightly. Where the full programme had been given, not more than one or two scabbed apples could be found on any tree and none on many trees. Insect damage was also slight. No special sprays had been used against Codlin Moth, since none had been caught.

Cost of Labour and Materials. As the whole plantation was not sprayed in the same way, the cost per acre of the full programme is given. A proportion of the time spent in moving the pipes, etc., has been added. No allowance has been made for the proportion of the foreman's time, nor for the cost of using the plant.

Wash	Quantity Gal.	Strength	Material	Labour			Total Cost		
				Spraying	Moving				
			£ s. d.	£ s. d.	s. d.		£ s. d.		
Tar Oil ..	457	7½%	1 15 0	0 8 0	1 9		2 4 9		
Petroleum ..	354	5%	1 7 0	0 4 5	1 9		1 13 2		
Lime-sulphur ..	256	3%	0 6 0	0 3 1	1 5		0 10 6		
Lime-sulphur ..	266	2½%	0 5 3	0 3 1	1 5		1 1 2		
Lead Arsenate ..		5 lb.	0 7 1						
and Spreader ..		10 oz.	0 4 4						
Lime-sulphur and ..	216	1%	0 1 8	0 2 10	1 5		0 7 10		
Spreader ..		5 oz.	0 1 11						
Copper-lime ..	31 lb.	—	0 7 6	0 0 9	—		0 8 3		
Do. ..	31 lb.	—	0 7 6	0 0 9	—		0 8 3		
Do. ..	31 lb.	—	0 7 6	0 0 9	—		0 8 3		
TOTAL			5 10 9	1 3 8	7 9		7 2		

The quantity used at petal fall was light, partly because of the size of some of the trees, but mainly because of the

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higher pressure. The quantity of copper-lime-dust used was rather heavy. The labour required for the tar-oil spraying was heavy on account of the time wasted in clearing blocked nozzles, etc. This waste time could have been saved by attention to the equipment in the previous season. The cost of the spreader in the petal-fall spray was greater than the cost of the lime-sulphur, and the object of using it is not clear. In comparing the cost of dusting with that of wet spraying, it has to be remembered that the whole piece has to receive the dust, whereas if a late spray had been applied only certain varieties (in this case Bramleys) would have been treated. The extra cost of dust has to be set against the advantage of quick work, requiring little labour.

The time during which spraying must stop, because the pipes, etc., are being moved, is seldom realized. It was noted on two occasions. In March, when it was wet and unpleasant, it took 1 hr. to collect the pipes from the orchard in which they had been left, 2 hr. to move them to the orchard to be treated (including laying out and filling), and $1\frac{1}{2}$ hr. to move and fill the pipes again, making $4\frac{1}{2}$ hr. for the 10 acres. In May it took $3\frac{1}{2}$ hr. in all. The labour employed in moving the plant for the 5 sprays on the 10 acres cost £3 17s. 6d. or 7s. 9d. per acre. Out of 21s. 5d. paid for labour on the 5 sprayings, 5s. 11d. was paid for pulling these very long hoses. Taking the 7s. 9d. and 5s. 11d. together, as the cost of moving this type of pipes and hoses, this amounts to 13s. 8d., or very nearly one-half the total wage bill of 29s. 2d. per acre for spraying. Labour on dusting is excluded.

Grading. It was impracticable to grade any large proportion of the crop, but it was felt desirable to grade samples, as an indication of the proportion damaged by insects and disease and the proportion coming up to National Mark standards.

The Emneths were picked in July, and samples were graded on July 28. There were so few blemishes on any of the trees, that the crop from only two trees was graded. The fruit had not been thinned and was small and immature, so that it was decided to grade to Extra Fancy standard for blemish only and to disregard size.

<i>Spray Programme</i>		<i>Under $\frac{1}{4}$ in. blemish</i>		<i>Over $\frac{1}{4}$ in. blemish</i>
Full	300 lb.,	97%	8 lb., 3%
Part	250 lb.,	86%	40 lb., 14%

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Over 90 per cent. of the crop receiving the full programme was entirely free from blemishes due to pests or disease. The blemishes were mainly due to Tortrix caterpillar damage. There were very few Capsid marks and only two apples with Scab.

Picking of the Bramleys commenced on September 14 and samples were graded on the following day. The crop was remarkably uniform and there was no object in grading a large number of trees. For the sake of brevity, the Extra Fancy standard is taken in the table below as including apples with under $\frac{1}{4}$ -in. blemish, though no apples may have a spot of Scab larger than a pin's head. The crop from two trees receiving the full programme, one tree receiving half-strength lime-sulphur at pink bud and sulphur instead of copper-lime-dusts (modified programme), and one tree (which received only the first lime-sulphur and three sulphur dusts), was graded, with the following results:

<i>Spray Programme</i>	<i>Under $\frac{1}{4}$ in. blemish</i>			<i>Over $\frac{1}{4}$ in. blemish</i>	
	<i>Extra Fancy</i>	<i>Small</i>	<i>Damaged</i>	<i>Apple scab</i>	<i>Insect marks</i>
Full	373, 72%	93, 18%	27, 5%	13, 2 $\frac{1}{2}$ %	14, 2 $\frac{1}{2}$ %
"	200, 75%	40, 15%	14, 4 $\frac{1}{2}$ %	6, 2 $\frac{1}{2}$ %	8, 3%
Modified ..	380, 77%	40, 8%	35, 7%	10, 2%	30, 6%
Part sprayed ..	75, 24%	13, 4%	14, 4%	107, 35%	100, 33%

The figures for the " part sprayed " tree indicate that the crop would have been of little value, if it had not been sprayed. Many apples had both Scab and insect marks and it was difficult to know in which grade to place them. Of those graded as insect marked, more than half were due to Capsid and the remainder to Tortrix. Many of the scabbed apples were cracked, although the attack was mainly a late one.

Taking the sprayed trees as a whole, only from 5 to 8 per cent. showed blemishes due to insects or disease, with practically no Capsid marks. The Extra Fancy and Small apples contained less than 3 per cent. with very small marks. The damaged apples were marked by wind damage, frost russet, bruising and the like. About 85 to 90 per cent. of the Bramley crop was entirely unmarked by pests or disease.

The proportion of the crop attaining National Mark Extra Fancy Standard was in excess of 70 per cent. and would have been more, but for the small apples. The proportion of small apples varied in different parts of the plantation, and may have been due to any one of a variety of causes.

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The figures for the tree that received the modified programme are quite inadequate to provide a comparison of the different materials used, but they do show that no general disaster occurred by reducing the pink bud spray to half-strength and substituting sulphur for copper-lime-dust. The apples from the trees dusted with sulphur had a very much brighter appearance than those from the trees dusted with copper-lime, many of which had a very dull appearance.

Discussion. The spraying programme was carried through satisfactorily and special thanks are due to the fruit foreman, Mr. H. F. Harding, for his keen interest and help, as well as to the men, for the thorough manner in which they carried out the work. Once the plant had been got into good working order and the men had become accustomed to the use of the new sort of spray, they very much preferred it. It will be seen from the figures that, when using lime-sulphur, each man sprayed an acre in about 2 hours. So far from being a discouragement, such speed of work is a definite encouragement and results in the men taking considerably more interest in the work and, therefore, doing it better.

The exact nozzle output used is of immense importance in commercial work and merits the closest attention. The larger the output, the more quickly and easily can the work be done, but if it is too large for the conditions, waste of material will result. The nozzle output, other conditions remaining the same, is regulated by the size of disc fitted and so small a difference as half a sixty-fourth of an inch makes a big difference in results. The pump output ($7\frac{1}{2}$ gal. per min.) was sufficient to carry two double nozzles with size $5\frac{1}{2}$ discs (0.085 in.), but the excessive length of hose (300 ft.) would not carry the quantity ($3\frac{1}{2}$ gal. per min.) without excessive loss of pressure, and this made it impossible to ascertain whether the men could use so large an output in the conditions. The best spray that could be got through these long hoses was 2.7 gal. per min. (size 5 discs). This size would do when only two men were required to spray, but the total output would then be only 5.4 gal. per min. When three men are available for spraying, the most economical discs to use with these nozzles and this plant, are $4\frac{1}{2}$ size (0.070 in.) giving a total output of 6.6 gal. per min. It was shown that three men could use this output satisfactorily. It would be impossible to use more men without reducing each man's output and

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thereby curtailing the amount of work he could do and making the work more difficult.

It should be pointed out that these small-bore portable pipes and very long hoses are quite unsuitable for high pressure work. The heavy cost of handling them and the impossibility of using a really large spray with them have been mentioned. Moreover, the total loss of pressure with a moderate spray is at least 100 lb. per sq. in. In addition there is the great waste of time when spraying must stop while they are being moved. This in itself is one of the most frequent causes of failure in spraying because it is impossible to get round the farm quickly enough. These disadvantages can be largely overcome by using two sets of larger-bore, lighter, portable pipes with quick-thread flexible couplings and short hoses, so that each man can manage his own hose and move to the second set of pipes which has been placed in position by an extra man while spraying is in progress. The extra cost of pipes will be offset by the saving in hoses. A still better method is to use underground pipes, but these cost £5 or £6 per acre, plus cost of laying.

Reference has been made to the russetting caused by copper-lime-dust on Bramleys and the eventual dullness of some of the fruit by picking time. It is very difficult to use this dust, especially in a wet season, without causing this damage, although some fruitgrowers are able to do it. It is well known that application when the fruit is damp, or blowing the dust directly on to the fruit, will cause it. It is not so well known that driving the machine up every row may be responsible, because this gives every apple several coats of dust. It is necessary to watch how far the dust is drifting and to give good cover so as to avoid dusting trees twice over. Very much larger trees than these have been dusted satisfactorily with only 20 lb. per acre, when going up every fourth row.

The most serious trouble in this plantation was Apple Scab on Bramleys. In spite of one lime-sulphur spraying in the green-flower stage and three sulphur dusts later, the "part sprayed" tree had 35 per cent. of scabbed apples. Apple Blossom Weevil was very plentiful in April and might do a lot of damage in some seasons. The tar oil and lead arsenate gave a good control of caterpillars, mainly Tortrix. Petroleum following tar oil gave an almost complete control

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of Capsid Bug and Red Spider. The effect of petroleum, without the preceding tar oil, was not quite so good. Possibly fewer dustings might have been given after three lime-sulphur sprays for Scab, but the summer was so wet that it did not seem worth risking. Apple Sawfly and Codling Moth were not seen.

It is frequently stated that the soil in this district is not suitable for apple growing, that crops are not heavy enough, that the conditions make it specially difficult to control Apple Scab, and that fruitgrowers who secure heavy crops of clean apples are "lucky." The fact that a very heavy crop of clean apples, including Bramleys, which graded over 70 per cent. National Mark Extra Fancy, has been grown as the result of only one season's spraying and manuring, is at least an indication of the source of the successful fruitgrower's "luck." The crop could hardly have been heavier anywhere for the size of the trees, and the appearance of the foliage is quite as good as any likely to be found elsewhere.

Summary. 1. A complete season's spraying programme was carried out in a 10-acre apple plantation in West Norfolk. Many fruitgrowers saw the work being done. The land was also manured and ploughed.

2. The existing spraying plant was used, but it was fitted with short lances and double nozzles, giving a different type of spray in larger quantity, and the working pressure was raised. Fewer men were employed.

3. The men found the work easier to do, although they covered the ground much more quickly than usual, and they preferred the method of working.

4. Detailed costs are given and the total expenditure was moderate.

5. A very heavy crop, 85 to 90 per cent. free from markings by pests or disease, was grown. The Emneths were small in July and should have been thinned. The Bramleys graded out over 70 per cent. National Mark Extra Fancy Grade and this figure would have been higher but for the small apples.

6. It is suggested that, with larger-bore portable pipes and shorter hoses, a higher effective pressure would be obtained. This would permit an appreciable saving of material and labour.

A STUDENTS' ANNUAL COMPETITION DAY

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THE Kent Farm Institute at Borden, near Sittingbourne, opened its doors for the first time as a training centre for young men in the autumn of 1929. Courses of instruction are provided in Agriculture, Commercial Fruit Growing and Poultry Keeping, starting in October and finishing in July. From the outset, the Kent Institute has devoted a good deal of the period of training to practical instruction on its 250-acre farm, with the object of turning out lads who are able to find employment on farms as agricultural workers, and, later, to obtain situations as farm foremen or bailiffs, or to take farms of their own. The demand for the students on leaving the Institute has, from the first, been very keen, and, at the time of writing, no student who has completed his course or courses is out of employment, or has been so for any length of time. Already 16 of the past-students have obtained situations as foremen or farm bailiffs, while 20 have their own farms and a number are working on their fathers' farms.

Competitions in practical work have been held in many counties at the end of a particular course of instruction, e.g., following a course of instruction in thatching or hedging or sheep-shearing, but the Competition Day at the Kent Farm Institute differs from all others in the fact that a number of different competitions are being held on the same day. They have aroused considerable interest in the district, and it has been suggested that something on the same lines might take the place of the old-time ploughing matches that are fast disappearing in most districts.

The first Competition Day was held in March, 1931. At that time there were only 20 students at the Institute, but for the last three years the Institute has been full with 40 resident students, so that the Competition Day has become a much bigger affair. March is by no means an ideal month, but it was chosen in order that a pruning competition might be included. The earlier competitions were held on a day early in the week, but for the last two years the first Saturday in March has been chosen. The choice of a Saturday enables a number of old students to be present, and each year more

A STUDENTS' ANNUAL COMPETITION DAY

farmers bring their fruit men to witness the apple-pruning competition, which is held in the afternoon.

Every student has had to enter for at least one competition, but the majority enter for all three that are open to their particular course. The competitions are:—

Agricultural Course ..	Thatching ; manure-sowing ; milking.
Fruit Course ..	Spraying ; pruning ; apple packing.
Poultry Course ..	Plucking ; trussing ; poultry judging.

No entry fee is charged. Prizes of 6s., 4s. and 2s. are awarded in each class, while additional prize money is given for a class confined to students who have done little or no milking before coming to the Institute. The prize money, amounting altogether to about £6, is obtained from the farmers in the district, and is usually collected in small sums of 2s. 6d. or 5s. in the Sittingbourne market. Three Challenge Cups are also awarded to the students gaining the most points in the three competitions of each course. The winners of the Challenge Cups are presented with a miniature cup, which they retain.

The points for the Cups are awarded on the following basis:—

First prize ..	12 points	Reserve ..	5 points
Second prize ..	9 points	Fifth ..	3 points
Third prize ..	7 points	Sixth ..	1 point

Sixth place points are only scored if there are 10 or more entries. Beside the prize money, award cards are also presented to the successful students. These are highly valued by their recipients, and afterwards are usually found on the walls of the students' cubicles.

In the Agricultural Course, competitors' heats have to be run off beforehand, and, for this, members of the Institute staff usually act as judges. With this exception, outside judges, either farmers, members of the County Advisory Staff or Inspectors of the Ministry of Agriculture are chosen.

On Competition Day, the finals of the Milking Contests are held at 6 a.m. and 3 p.m. and marks are awarded on the scale of points used at the London Dairy Show. Owing to the difficulty of a number of students being in the finals of the manure-sowing and thatching events, and also owing to the uncertainty of the weather, the manure-sowing competition is usually held on some suitable day preceding Competition Day, but, in order to complete the programme, a manure-sowing demonstration is held during the morning, provided



Photo: H. J. S. J. S.

A Students' Annual Competition Day - two competitors thitching

Photo: S. J. S.



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the weather is suitable, by those who are not thatching. Small prizes are given for this, but the awards do not count towards the Challenge Cup. The area of ground allotted to each student for manure-sowing varies, but usually each competitor has to manure $\frac{1}{4}$ acre of ground with superphosphate at the rate of 3 cwt. per acre. Eight students are left in the final of the thatching competition, which is held from 9 a.m.-12 noon, and from 1 p.m.-3.30 p.m.; any competitor who is also in the final of the milking contest, and is, therefore, required to milk in the afternoon, commences thatching an hour earlier.

No preliminary heats are held in the fruit competitions, for which 13 or 14 students usually enter. The spraying contest is held during the morning from 9 a.m.-12 noon. Each competitor has to spray in one of the apple orchards for half an hour, and is judged on speed, thoroughness, and method; and for this purpose lime-sulphur wash is usually employed. The pruning competition takes place from 1 p.m.-3.30 p.m.; last year, each student had to prune eight 12-year-old trees. The trees selected were two Bramleys and two Worcesters (one a vigorous-growing, and the other a weak-growing, variety), and one each of Lane's, Allington, Cox and Newton. To save confusion, as the trees are somewhat separated, each tree is labelled with the competitor's number, and there are several stewards on duty to show the student which is his next tree to prune. Before the competition starts, the students are told that they must not cut out any large branch without informing the steward or judge, and, if consent is not given for this, a coloured label is tied on to the branch to show that the branch would have been cut out if the competitor had used his own discretion. This practice has always worked well; and in the five competitions no tree has been spoilt by over-eagerness of the young competitors. The apple-packing (in boxes) takes place previously to the Competition Day, but the boxes are usually judged while the other competitions are in progress. Each student has to pack two bushel boxes, and, in making the awards, time is also taken into consideration.

For the Poultry Competitions, the plucking is done during the hours of 9.30 a.m.-12 noon. Competitors have to kill and pluck three birds. The trussing is also done at the same time. Two birds have to be trussed for roasting. Although an hour is allowed for each of these competitions, competitors are

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timed, and this is taken into consideration by the judge when he makes his awards. The Poultry-judging Contest is held from 1.15 p.m.-3.30 p.m. Two breeds are selected, and students have to place the four birds of each breed in their order of merit as layers, and afterwards give their reasons for their placings. Nine students competed in the Poultry Competitions last March.

Tea is served at 4 o'clock in a large barn, and half an hour later the prizes are distributed. On the last two occasions, nearly a hundred visitors were present at the distribution of prizes, at which the judges were invited to give their criticisms of the work done during the day. Visitors are always welcome at these competitions, and, in order that they may have no difficulty in finding their way about the farm and buildings, large cards are displayed, directing the way to the various competitions. On arrival at the car park, each visitor is also handed a stencilled programme of the events. Altogether, the Competition Day of the Kent Farm Institute is a very keen and live affair. It is unfortunate that competitions like sheep-shearing cannot be held on the same day, but a competition for this is held later in the season. Students also compete in the Romney Marsh Sheep-Shearing Trials.

In the early days of the Institute, it was found that, although the students were very keen on their lectures, and were anxious to learn any new work on the farm, there was a falling off in keenness in doing the ordinary routine operations of the farm as the courses progressed during the late spring and summer. The Competition Day has very largely solved this difficulty. The problem has also been eased by the Kent Branch of the National Farmers' Union awarding Silver Medals to the best student at practical work during the whole period of his training. These medals are awarded in each of the three courses and are presented by the Chairman of the Kent Branch of the Farmers' Union on the last evening of the summer term. On more than one occasion, a Competition-Day Challenge-Cup Winner has obtained one of these medals.

THE WORKING OF THE SEEDS ACT, 1920, IN THE SEASON 1935-1936

DURING the period under review, the Ministry has again carried through its normal procedure under the Seeds Act, viz., the visiting by Inspectors of seedsmen, merchants, retailers, farmers, etc., all over the country, and the drawing of control samples for check testing at the Official Seed Testing Station, Cambridge. These measures comprise the chief means of oversight of the trade in seeds and the results during the past year indicate that compliance with the Act is, on the whole, fairly good, although it is obviously necessary for the Ministry to maintain its present activities.

At the same time, developments that have been gradually taking shape within the trade over a number of years have necessitated special measures that were not perhaps foreseen in the early days. Reference has been made in previous reports to the gradual change in business methods of the smaller horticultural and agricultural seedsmen. The former, more often than not, now handle mainly pre-packed seeds purchased on a sale-or-return basis from firms of wholesale packeters. They have ceased to be the principals and have become the agents. On the other hand, the agricultural merchant, who at one time had a small trade in agricultural seeds, if he has not given up dealing in seeds entirely, owing to the competition of market agents and representatives of the bigger seed houses, has frequently ceased to carry any stocks at all, and merely books orders that are dispatched direct to the customer from the wholesaler.

These changing conditions have the effect, so far as bulks of seeds are concerned, of reducing the number of separate stocks available for inspection by the Ministry's officials, and of making more difficult the checking of the quality of the supplies that reach the farmer direct from the remote supplier. It has also been apparent during recent seasons that retail sellers of agricultural seeds have been taking delivery of their supplies later in the season than formerly, thus restricting the period during which sampling is possible. In these circumstances, the Ministry has sought to adjust the balance by means of "investigation" samples, i.e., check samples drawn on farmers' premises from parcels of seed as delivered. It may be necessary to increase still further the number of such

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

samples, which give direct information as to the quality of seed and the particulars declared in respect of actual sales to farmers.

The Ministry has also found it necessary to give increasing attention to the practice, referred to in last year's report, of using a price list or catalogue for the purpose of making a statutory declaration. The Act permits this method of declaration, provided that the purchaser is given a statement in writing referring specifically to a printed price list or printed catalogue containing the prescribed particulars. It is obvious, therefore, that in order to comply with the Act, the price list or catalogue must include the necessary particulars of purity, germination, country of origin, or such other details as are required, set out in such a form that the purchaser can relate the written statement which he receives to the entries in the price list or catalogue and thereby ascertain the particulars of the seed with which he has been supplied. Too often, unfortunately, seedsmen, in preparing their catalogues, do not bear this requirement sufficiently in mind, with the result that, especially in respect of mixtures, it is often impossible to identify the entries relating to the seeds that have been supplied to the purchaser. In a number of instances, the Ministry has found it necessary to advise seedsmen as to satisfactory methods of procedure, and seedsmen who adopt the practice of using their seed catalogue as an instrument for compliance with the requirements of the Seeds Act are warned that unless they exercise particular care in the compilation of their price list or catalogue, so that purchasers can identify the particulars relating to seed purchased, they may lay themselves open to the charge of failing to deliver the prescribed particulars on sale of seeds, which is after all the fundamental requirement of the Act.

Visits to Seedsmen. Numerous visits to seedsmen were made by Inspectors during the year.

Apart from the general features in the seed trade to which reference has already been made, it may be said that the expansion of the packet trade has continued, with a marked increase in the number of agents selling packets obtained from well-known houses, and with a reduction in the number of small cards of packeted seeds that were formerly offered by sundriesmen.

The visitation of seedsmen's premises during the year also

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brought to light instances in which seed described as " clover thirds," " Montgomery seconds," " ribby red clover," " wild white clover cleanings," had been sold without the necessary declaration of particulars of purity, germination, etc. It would appear that some misapprehension may exist among seedsmen as to the inclusion of such types of seed within the scope of the Act. Obviously, however, the provisions of the Seeds Act apply to all seeds included in the Seeds Regulations, 1922, irrespective of grade, and in the case of mixtures of grass and/or clover seeds, when used for agricultural purposes, the prescribed particulars of each of the scheduled seeds should be declared in accordance with Regulation 3 (1) (j) of the Seeds Regulations, 1922.

Farmers and the Act. The number of visits paid to farmers and the number of investigation samples taken on farms, were both more numerous than in the preceding year. The value of these samples has already been indicated; and, in the year under review, they have revealed the fact that, excluding the instances of failure by the seller to make a proper declaration of the statutory particulars, the quality of the seed delivered to farmers has in the main conformed to the particulars declared within the limits of variation permitted by the Act. The most unsatisfactory section of these samples was that of the grass and clover mixtures. In 25 per cent. of these mixture samples no particulars were delivered on sale; and, in another 10 per cent., it was impossible to identify the components in the price lists to which reference was made by the seedsmen. It is, of course, common practice for the farmer to rely upon his seedsman to supply him with a suitable mixture for his particular requirements, but it is regrettable that too often the farmer neglects to require from the seller those elementary safeguards that the Seeds Act was designed to provide.

Sale of Seed Potatoes. No special comment is called for with regard to the oversight of seed potato sellers during the past year.

The chief item of interest as regards seed potatoes was the issue of the Seeds (Amendment) Regulations, 1935. These amending regulations had the effect of adding to the existing classification contained in the Seeds Regulations, 1922, two new classes, viz., Class 1 (English Special Stock) and Class 1

THE WORKING OF THE SEEDS ACT: SEASON 1935-36

(Welsh Special Stock), which are defined as potatoes grown in England and Wales respectively "under the provisions of a scheme authorized by the Minister." So far, two schemes have been authorized by the Minister for the purpose of these Regulations, i.e. those of the Cumberland Seed Potato Growers' Association and the North Wales Certified Seed Potato Growers', Limited.

The Seeds (Amendment) Regulations, 1935, also include an extension of the previous definition of 'Class 1 (English once grown)' so as to bring within its scope such produce of the new "Special Stock" classes as is not eligible to be sold as special stock seed. In all other respects the Seeds Regulations, 1922, remain unaltered.

Private Licensed Seed Testing Stations. Three additional stations have received licences during the year and the number of private licensed stations has reached 81.

It is of interest to note the classification of these stations, viz.—Full licence (i.e., licence to test all seeds specified in Regulation 2 of the Seeds Regulations, 1922), 33; all seeds except grasses, 2; cereal seeds only, 27; various partial licences, 19.

The number of Reserved Portions (duplicate samples of seeds tested by the stations) drawn during the season for check testing at the Official Seed Testing Station was 1,375, comprising 386 clover samples, 107 grasses, 334 cereals, 224 field seeds, 156 pulses, and 168 garden seeds (excluding peas).

A comparison of the results obtained as a result of the tests by the stations and by the Official Seed Testing Station, assists the Ministry to form its conclusions as to the efficiency of the stations, which is a matter of considerable importance in view of the large quantity of seed tested by the stations for the purpose of declarations under the Act in respect of their own purchases and sales. The number of discrepancies this season was 111 or just over 8 per cent. of the total number of samples. Although this is a slight increase over the previous season's percentage, it cannot be regarded as a serious variation. It will be appreciated in this connexion that when, on a check test, the result obtained by the private station is found to be outside the permitted limits of variation, a discrepancy is recorded whether the private station's figure is above or below that of the Official Station, so that the percentage of cases in which a purchaser would have been

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prejudiced by the result of an inaccurate test at a private licensed station would clearly be much less than 8 per cent.

There have been a few changes in the personnel of the analysts during the year; and, while there has been no marked change in the laboratory arrangements, the equipment of the stations is gradually improving.

On the whole, the work of the private licensed stations is done in an efficient manner; and, in any cases of difficulty, advice and assistance are freely given by the Official Seed Testing Station and by the Ministry's Inspectors.

Control Sampling. The number of samples taken during the season for the purpose of checking the particulars declared on the sale of seeds was 1,432. They comprised 446 grasses and clovers, 118 cereals, 140 field seeds (other than sugar-beet), 363 "loose" garden seeds, 289 packeted seeds and 76 sugar-beet and seed potatoes.

Farm and Garden Seeds. It was found necessary to draw attention to 50 instances of discrepancies in the particulars declared and to 59 incomplete or irregular declarations. Of the 50 discrepancies, 15 were in respect of purity and 35 of germination. Stated as percentages, the figures show that 7.6 per cent. of the total samples called for special attention, 1.1 per cent. in regard to purity and 2.4 per cent. owing to germination discrepancies, while the remaining 4.1 per cent. were cases of omissions from or errors in the declaration.

As regards the purity discrepancies, 4 samples came within 3 per cent. of the declared figure, 3 showed a variation of between 3 and 5 per cent., and 8 exceeded 5 per cent. With regard to the germination discrepancies, 7 samples showed a variation of less than 10 per cent., 12 others varied by less than 15 per cent., leaving 16 in which the difference between the germination declared and that found in the check tests amounted to more than 15 per cent.

Grass and clover seeds, which showed 5 discrepancies in purity and 14 in germination, again occasioned considerable trouble, as is perhaps to be expected in view of their tendency under certain conditions to lose vitality rather quickly. Garden seeds necessitated action in almost the same number of instances, there being 8 purity and 10 germination discrepancies. Cereal seeds showed 1 and field seeds 6 discrepancies in the germination particulars only, while

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packeted seeds showed 2 discrepancies as to purity and 4 as to germination.

Seed Potatoes. Six instances of misdescription of variety were investigated (5 of which concerned Scottish sellers and were accordingly referred to the Department of Agriculture for Scotland), and 7 instances of false particulars of size and dressing (of which 4 were in regard to Scottish or Irish sellers). There were 8 further cases that concerned the delivery of the statutory statement in that it had either not been given to the purchaser or was incomplete in respect of one or more items. Suitable warnings were issued in respect of these infringements and also in a number of other contraventions of lesser consequence that were reported by Inspectors.

Prosecutions. While there were a number of instances during the season in which a decision concerning the taking of legal proceedings was reached with great difficulty, only one prosecution was actually undertaken. This concerned a firm of seedsmen in East Anglia who, in connexion with a sample of lucerne seed, had made a declaration that was not based on the results of a test made in accordance with the provisions of the Seeds Act. The test had been carried out on the firm's own premises, which are not licensed for testing for the purposes of the Act, and there was therefore an infringement of the Act, which requires that such a test shall be made either at one of the official seed testing stations or at a testing station licensed by the Minister. The defendants pleaded " Guilty " and were fined £1 and costs.

Publications. Copies of the Seeds Act, 1920 (price 2d., post free 2½d.); the Seeds (Amendment) Act, 1925 (price 1d., post free 1½d.); the Seeds Regulations, 1922 (price 3d., post free 3½d.); and the Seeds (Amendment) Regulations, 1935 (price 1d., post free 1½d.), are obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller.

A convenient summary of the provisions of the Act and Regulations, showing in addition the fees for testing at the Official Station and the size of seed samples to be sent, and also a memorandum on the drawing of samples for testing, may be obtained free of charge on application to the Ministry at 10, Whitehall Place, London, S.W.1.

THE CONTROL OF THE WHITE MOULD DISEASE OF NARCISSUS*

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THE narcissus is subject to a number of diseases that cause premature decay of the foliage. One of the most widespread of these is White Mould, due to the fungus *Ramularia vallisumbrosae* Cav., which occurs year after year in an epidemic form on leaves and flower stalks in districts where warm, moist atmospheric conditions prevail during the spring. The fungus was first discovered in Italy in 1899, but the disease was not recorded in this country until 1906, since when it has appeared in various counties in the north, east and Midlands, as well as in the west. It is, therefore, probably widely distributed throughout the British Isles, but assumes epidemic proportions only in the south-west. In Devon and Cornwall, the disease usually appears in January and spreads during February and March. The foliage on beds of susceptible varieties that have been badly attacked may be completely withered as much as three weeks or a month before the normal time of ripening off. The diseased plant consequently loses the use of the leaves for food manufacture during a considerable part of the season in which the bulb normally stores such food for the development of leaves and flowers in the following year. Measurements of the effect of the premature foliage decay upon the weight and grade of bulbs lifted have not yet been made, but it is believed by growers to result in a poorer crop of flowers in the following year. Direct loss of flower crop may be caused in late varieties, such as Double White, when the disease attacks the flower stalks.

There are considerable differences amongst commercial varieties of narcissus in their susceptibility to White Mould. The varieties most severely affected in the south-west are Golden Spur, Sunrise, *Ornatus maximus*, and Double White.

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On the other hand, King Alfred, Emperor, *Maximus superbus*, Henry Irving, Bath's Flame and *Polyanthus* varieties tend to resist attack, at least until near the end of the growing season.

Description of the Disease. On susceptible varieties the disease may be detected as early as the middle of January. It appears first in the form of small, sunken, greyish streaks, usually situated near the tips of the leaves. The streaks increase in size, and form dark greenish patches on which conspicuous masses of white powdery spores are produced in moist weather (Fig. 1). The area producing spores becomes surrounded by a more or less extensive zone of yellowed tissue where the leaf has been killed. In moist weather, the disease extends down the leaf rapidly, but, under cold, dry conditions, it may be completely held in check. In dry weather, also, the characteristic white spore-masses may be absent and the disease is then easily confused with other leaf troubles. When the leaves are completely withered, the production of the White Mould spores ceases, and, within the leaf, the fungus develops vast numbers of minute, hard, black bodies known as sclerotia. These sclerotia are the form in which the fungus remains alive during the dormant season of the narcissus plant.

The bulbs of affected plants do not become attacked, for the fungus is confined to the portion of the plant growing above the ground and has never been observed on any part of the bulb. This fact probably explains the general observation that newly-planted beds of susceptible varieties are not appreciably attacked during their first year, but that an epidemic may be expected after the first season. Apparently, therefore, the disease is not normally carried on the bulb.

Life History of the Fungus. From February to May, the fungus is distributed from plant to plant by means of cylindrical spores, which are produced in enormous numbers on the White Mould lesions. These spores are carried principally by wind and the splashing of rain drops, and they germinate rapidly in moist weather. They are not very hardy, however, and cannot survive drying for any length of time. During the dormant period of the narcissus bulb in summer, the fungus persists by means of the black sclerotia, which remain in a state of inactivity in withered leaves on the surface of the ground during the summer and



THE PHOTARY

FIG. 1. White Mould Disease of Narcissus.
Showing the appearance of conspicuous masses
of white powdery spores on the leaves.



PLANT P. H. GREGORY.

FIG. 2. Illustrating the control effect on White Mould Disease of Narcissus (variety Golden Spurr) by spraying with Bordeaux Mixture. The right-hand bed was sprayed twice and has retained green foliage, whereas the unsprayed leaves on the left are all dead.

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autumn. Soon after the spear-like shoots of the narcissus appear above ground in winter, the sclerotia germinate. Each sclerotium may produce a crop of thread-like spores* that are capable of infecting the leaves of healthy narcissus plants, and these plants then produce the characteristic masses of White Mould spores that spread the disease rapidly during spring.

Control. Methods at present open to the grower for the control of the disease include attention to general plant hygiene, and spraying and dusting foliage to prevent infection.

General Sanitation. The object to be attained by cultural practice is to prevent the infection of plants in the early stages of growth from spores produced by the sclerotia left in decayed leaves of the previous season. Crop rotation should be practised where possible. There is no evidence at present to suggest that the fungus can contaminate the ground for more than one year, hence a long interval between successive narcissus plantings should not be necessary. If it is necessary to replant narcissi on land that has carried a stock affected with White Mould, a resistant variety such as King Alfred, Bath's Flame or Soleil d'Or should preferably be used. Two susceptible varieties should not be planted close together, as the likelihood of both being heavily infected is thereby increased. Thus, stocks of Golden Spur and Sunrise should be planted as far apart as possible.

The practice of raking over the beds as early as possible, which is so important in checking damage by bulb-fly, will help to remove the infected leaves before they disintegrate and become difficult to handle. Infected foliage should be burnt. In districts where a dry atmosphere prevails, epidemics can probably be prevented, except in abnormal seasons, by removing and burning the leaves. It is certain, however, that in the south-west of England, removing and burning the withered leaves from infected beds is not an adequate control of the disease, for, even when this is scrupulously carried out, the disease will reappear in the following year. When it is considered that one square inch of withered leaf may carry upwards of ten thousand sclerotia of the fungus, the impossibility of eliminating infection

* It is intended to publish elsewhere a scientific account of the germination of the sclerotium, which has been fully investigated.

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completely by merely raking over the beds becomes apparent. General hygienic measures should be adopted to delay the onset of the disease, but, to control it satisfactorily, spraying will usually prove necessary.

Recommendations for Spraying. Spraying experiments that have been carried out in various parts of the early-flower districts of Cornwall and the Isles of Scilly have shown that White Mould can be controlled satisfactorily by the application of Bordeaux Mixture, and it is now possible to make certain recommendations to growers who desire to control the disease.

Bordeaux Mixture should be prepared according to the following formula :

Copper sulphate (bluestone)	4 lb.
Hydrated lime (slaked lime)	3 lb.
Water	40 gal.

The hydrated lime must be of the highest quality, fresh, and in the form of a fine powder. It can be obtained in paper-lined bags. The copper sulphate should be dissolved in 30 gal. of water in a wooden vessel, and a wetting agent added to this solution as recommended below. The lime should be stirred slowly into the remaining 10 gal. of water in a separate vessel and then added slowly, with constant stirring, to the copper-sulphate solution. A blue gelatinous precipitate will be formed and the mixture must be used within a few hours.

The waxy surface of the narcissus leaf is difficult to cover with spray fluid, but this obstacle can be overcome by adding suitable wetting agents to the spray. A number of the new proprietary wetters now on the market have proved adequate for the purpose. The amount of wetting agent needed depends on a number of factors, including composition of spray, hardness of water, nature of foliage to be sprayed, etc. To obtain an adequate cover of narcissus foliage, it is usually necessary to employ a somewhat higher concentration of the wetter than that recommended by the manufacturers for spraying plants with less waxy foliage.

Spraying machines of the pneumatic, knapsack or wheelbarrow type have proved satisfactory, but it is essential in applying the spray that a pressure of not less than 50 lb. per sq. in. be maintained. The spray is best applied from a fine nozzle, and it is most convenient to have two nozzles at the

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end of a lance, so arranged that they throw the spray more or less horizontally in opposite directions. This arrangement has the advantage of spraying both sides of the vertically placed narcissus leaf at one operation. The quantity of spray required for an efficient cover is about 200 gal. per acre for each application.

Experience in both 1935 and 1936 has emphasized the need for an early application of spray to control White Mould. Considerable variation in the date for the first application evidently exists, even between farms in the same locality, but, generally speaking, it should be made when the shoots are from 3 to 6 in. high. The need for subsequent applications will depend on local conditions and rainfall, but, in the experiments already carried out, one or two further applications of spray at monthly intervals have proved satisfactory. Spraying should be done during weather that will give the deposit time to dry thoroughly before it is exposed to rain. When it is once dry, Bordeaux Mixture adheres excellently. Fig. 2 illustrates control of White Mould on beds of narcissus Golden Spur, photographed on May 13, 1935. The right-hand bed was sprayed with Bordeaux Mixture twice, and has retained green foliage, while the unsprayed leaves on the left-hand bed are all dead.

It should be noted that a certain amount of spray damage may sometimes appear on narcissus foliage after the application of copper fungicides. This usually takes the form of purplish-brown spots or sunken white or brown areas on the leaves. With well-made Bordeaux Mixture, damage of this kind is usually negligible, but it may be increased if poor quality lime is used.

In districts where the difficulties of obtaining water are too great to permit of wet spraying, the use of a copper-lime dust is worthy of trial. So far, the control of White Mould obtained with copper-lime dusts has not been so good as that following wet sprays, and a greater number of applications will probably be necessary.

LICENSING OF STALLIONS

Heavy stallions were wholly responsible for the increase during the year under review, and numerically this was mainly attributable to the number of Shires licensed, which showed an increase of 114 (or 11 per cent.) as compared with the 1935 figure. Percherons show the largest relative increase, rising from 80 in 1935 to 99 in 1936 (24 per cent.); minor increases were shown by Suffolks, which rose from 210 in 1935 to 226 in 1936 (8 per cent.), and Clydesdales from 184 to 191 (4 per cent.). The number of licences issued in respect of light breeds (including ponies and cobs) was practically unchanged, 275 in 1936 as against 277 in 1935.

Licences were refused in respect of 74 stallions, as compared with 52 in 1935. The increase of 22 is mainly due to the number refused as being affected with whistling (13 in 1936 as compared with 5 in 1935) and for defective physique and conformation (13 in 1936 to 2 in 1935). Appeals against refusals numbered 13, a decrease of 1 on the previous year's figure, and 8 were successful as compared with 9 in 1935. The breeds of the rejected stallions and the reasons for rejections are set out in the table on page 870.

Forty-seven infringements of the Act were reported to the Ministry during the season, a similar number to that reported in 1935. In two instances, proceedings were taken by the police in respect of unlicensed stallions that were being travelled for service, and in both of them convictions were recorded.

Most of the other infringements reported were in respect of stallions, though licensed, being travelled for service, or exhibited on premises not in the occupation of the owner, with a view to their use for service, unaccompanied by their licences, and in these instances the owners and leaders were warned by the Ministry or police as to the requirements of the Act in this respect.

Stallion owners in possession of licences for the year ended October 31, 1936, are reminded that these licences expired on that date, and should be returned to the Ministry. Application for licences for the 1937 travelling season may now be made, and it will greatly assist the Ministry to make economical arrangements for the examination of stallions, if applications are made as early as possible. Application forms may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

LICENSING OF STALLIONS

NUMBER OF APPLICATIONS FOR LICENCES AND NUMBER OF
LICENCES GRANTED AND REFUSED IN ENGLAND AND WALES,
1935-36

Breed or Type	PEDIGREE (i.e., stallions entered or accepted for entry in the recognized Stud Book of their breed)			NON-PEDIGREE (i.e., stallions not entered or accepted for entry in a recognized Stud Book)			Totals of each breed or type (pedigree and non-pedigree)		
	Applications	Licensed	Refused	Applications	Licensed	Refused	Applications	Licensed	Refused
HEAVY.									
Clydesdale	172	165	7	27	20	1	199	191	8
Percheron	96	94	2	6	5	1	102	99	3
Shire	1,053	1,018	35	182	170	12	1,235	1,188	47
Suffolk	225	221	4	6	5	1	231	226	5
Others	—	—	—	75	71	4	75	71	4
LIGHT.									
Arab	8	8	—	2	2	—	10	10	—
Cleveland Bay	3	3	—	—	—	—	3	3	—
Hackney	9	9	—	5	5	—	14	14	—
Hunter	1	1	—	7	6	1	8	7	1
Thoroughbred	105	160	5	4	4	—	169	164	5
PONY AND COB.									
Dales	9	9	—	7	7	—	16	16	—
Fell	5	5	—	1	1	—	6	6	1
Highland	1	1	—	—	—	—	1	1	—
Polo and Riding	8	7	1	1	1	—	9	8	1
Shetland	7	7	—	—	—	—	7	7	—
Welsh	8	8	—	1	1	—	9	9	—
Welsh Cob	15	15	—	15	15	—	30	30	—
TOTALS	1,785	1,731	54	339	319	20	2,124	2,050	74

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for October, 1936, are given below, with comparative figures for September, 1936, and October, 1935. In October, 1936, the wholesale liquid milk price was 1s. 5d. per gal., an increase of 2d. per gal. on the previous month's price, but the same as in October, 1935.

Region	Pool Prices			Producer-Retailers' Contributions		
	Oct. 1936	Sept. 1936	Oct. 1935	Oct. 1936	Sept. 1936	Oct. 1935
	d.	d.	d.	d.	d.	d.
Northern	13	11½	13½	3 10	3 10	3 10
North-Western	13	11½	13½	3 10	3 10	3 10
Eastern	13½	12	13½	3 10	2 10	2 10
East Midland	13	11½	13½	3 10	2 10	3 10
West Midland	12½	11½	13	3 10	3 10	3 10
North Wales	12½	11½	13½	3 10	3 10	3 10
South Wales	12½	11½	13½	3 10	2 10	3 10
Southern	13½	12	13½	3 10	2 10	2 10
Mid-Western	12½	11½	13	3 10	3 10	3 10
Far-Western	12½	11½	13	3 10	3 10	3 10
South-Eastern	13½	12½	14	3 10	2 10	2 10
Unweighted Average ..	12·91	11·64	13·43	3·63	2·96	3·18

These prices and rates of contribution do not make allowance for any premiums for special services and level deliveries, or for the accredited premium.

The number of producers who qualified for the accredited premium was 18,930, and the sum required for the payment of the premium was equivalent to a levy of 349d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 2½d. per gal. on liquid-milk sales, as compared with 2d. per gal. in October, 1935. A levy of ½d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Oct., 1936 (estimated)	Oct., 1935
	Gal.	Gal.
Liquid	47,654,469	47,267,205
Manufacturing	25,325,116	21,290,207
	<hr/> 72,979,585	<hr/> 68,557,412
Percentage liquid sales	65·30	68·95
Percentage manufacturing sales	34·70	31·05

MARKETING NOTES

The average realization price of manufacturing milk during October was 5·766*d.* per gal. compared with 6·14*d.* per gal. for October, 1935. The quantity of milk manufactured into cheese on farms was 1,836,381 gal. compared with 2,148,191 gal. in September and 1,400,136 gal. in October, 1935.

Pigs and Bacon Marketing Schemes : *Bacon Pig Contract for 1937.* Consequent upon the failure of the Pigs and Bacon Marketing Boards to reach agreement upon all the terms of the 1937 contract, the Boards requested the Minister to appoint an independent person to decide the matters in dispute. The Minister accordingly nominated Sir Robert B. Greig, LL.D., D.Sc., whose decision was announced on October 29. The contract that has been prescribed by the Pigs Marketing Board embodies Sir Robert Greig's findings. For 1937, there will be three types of contract :

- (i) A direct contract between producer and curer ;
- (ii) A dead-weight contract with the Pigs Marketing Board ; and
- (iii) A live-weight contract with the Board.

Pigs on Board contracts will be resold to curers, their allocation amongst curers to be on a basis to be agreed between the two Boards. The last date for the receipt by the Board of contracts was fixed as November 30, 1936, direct, and for Board contracts, December 7, 1936.

The following is a summary of the principal terms and conditions of the *direct contract* :—

Prices. The average annual price payable for a basic pig, which will be a Grade B pig in Class I, is to be 12*s.* per score. This price is to be varied monthly as follows :—

	<i>s.</i>	<i>d.</i>		<i>s.</i>	<i>d.</i>		<i>s.</i>	<i>d.</i>
January ..	12	3	May ..	12	0	September ..	11	6
February ..	12	6	June ..	11	9	October ..	11	6
March ..	12	9	July ..	11	6	November ..	11	9
April ..	12	6	August ..	11	6	December ..	12	6

These monthly basic prices will be increased by 1*d.* per score for each complete 3*d.* by which the ascertained cost of the standard feeding stuffs ration exceeds 7*s.* 6*d.* per cwt. up to a maximum feeding cost of 9*s.* per cwt., and 1*d.* per score will be deducted for each complete 3*d.* by which the feed prices falls below 7*s.* 6*d.* per cwt.

If the number of pigs contracted for on January 1, 1937 (or such later date as may be agreed between the Boards), reaches a total of 2,400,000, the basic price is to be increased by 2*d.* per score.

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The basic price will not vary with bacon or offal prices.

In addition, when live pigs are carried by rail, there is payable, at the option of the curer, a further sum of 1s. per pig when the distance, station to station, is over 50 miles up to 100 miles, 2s. per pig when the distance is over 100 miles up to 175 miles, and 3s. per pig for greater distances.

Classes and Grades. A new schedule of classes and grades, and of consequent additions to or deductions from the basic price, is adopted. The weight classes are to be:—

Class I.—7 score to 8 score 7 lb. dead-weight.

Class II.—8 score 8 lb. to 9 score dead-weight.

Class III.—9 score 1 lb. to 10 score 10 lb. dead-weight.

Class IV.—Over 10 score 10 lb. dead-weight.

There will be three main grades, A, B, & C, by reference to new back and belly measurements and either a shoulder or a loin measurement, and in addition Grades F, L, & DB, for pigs which fail in the scheduled measurements.

Delivery. The bonus scheme and the requirement that at least 25 per cent. of the number contracted for must be delivered in the first four months of the year have been discontinued; but the number of pigs contracted to be delivered in the last four months is again to be not more than 45 per cent. of the total contracted for over the 12 months.

Tolerance is permitted only to the extent that, subject to certain conditions as to payment, pigs may be delivered one month earlier or later than the month of contract.

Transport and Insurance. Flat-rate transport arrangements similar to those operating in 1936 have again been made with the Railway Companies, but the minimum load for road transport by the Companies is reduced to 8 pigs made up in not more than four collections.

The curer is again free to insure against loss through damage to pigs during transit or by disease, or he may carry these risks himself, and for this purpose 6d. per pig is to be deducted by the curer from the price payable.

Defaults. Provision is again made for a producer or a curer to be freed from his liability under the contract in cases of involuntary default such as outbreaks of disease; for other defaults the producer is to pay £1 per pig (12s. 6d. to the Board, 7s. 6d. to the curer).

General. The contract may be terminated by the Bacon Marketing Board if the total number of pigs secured on contracts is less than 2,200,000. If either that Board or the

MARKETING NOTES

Pigs Marketing Board determine that the prices payable under the contract are uneconomic, and failing agreement on alternative terms within seven days, the matter is to be referred to an independent person, who may settle terms on which the contract shall be continued. Provision is also made for the termination of the contract in certain circumstances if the present system of regulation of imports of bacon is discontinued or modified or a levy subsidy scheme affecting pigs and bacon is brought into operation.

Board Contracts. All Board contracts must be made through a District Agent of the Board, who will be responsible for the supervision of the performance of the contract. For this service, producers will pay 1s. per pig to the Board. Curers will pay the Board 2s. per pig as a commission for obtaining pigs on Board contracts; and they will also pay a sum of 2s. 3d. per pig on all rail-borne pigs irrespective of the distance travelled.

The *dead-weight* Board contract is similar in all essentials to the direct contract, subject to the variations mentioned in the preceding paragraph; the pigs will be sold to curers on sub-sale contracts and producers will receive payment (including the 2s. 3d. per pig in respect of transit) through the Board.

The *live-weight* Board contract is a new form of contract and is designed to meet the need of small producers and others who prefer payment on the basis of the live-weight ascertained at the point of despatch. The pigs will be weighed and despatched by rail from collecting centres. There are only two weight-classes under this contract; 208 to 240 lb. live-weight and 230 to 275 lb. live-weight. Pigs under 208 lb. and over 275 lb. will be rejected at the collecting centre. Payment will be made on the live-weight ascertained at the collecting centre and on the grading of the carcass at the factory. The live-weight price per score for a grade B pig will be 8s. 8d. when the dead-weight price per score of a basic pig is 12s.; Grade A pigs will receive a bonus of 4d. per score live-weight, and there will be appropriate deductions for lower-grade pigs. The additional sum of 2s. 3d. per pig in respect of rail-borne pigs, to be paid by the curer, will be retained by the Pigs Board and will be available to meet any losses that may occur in reselling these pigs to curers on a dead-weight basis.

Bacon-Pig Prices for November, 1936. The contract price

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of the basic pig (Class I, Grade C) for November, 1936, was 12s. 2d. per score compared with 12s. for October. The cost of the feeding stuffs ration was 8s. 9d. per cwt. compared with 8s. 5½d. for the previous month, while the ascertained price of bacon fell from 97s. 7d. per cwt. to 93s. 5d. The realization value of offals rose from 8s. 5d. to 8s. 8d. per pig.

Potato Marketing Scheme. At the third annual general meeting of registered producers, on October 29, 1936, the three retiring Special Members, Messrs. J. E. W. Beeston, J. T. Fitzpatrick and A. Graham were re-elected. Meetings for the election of district members were held on October 17 in the East Midland, Northern, Scotland, West Midland and Wales districts. In the East Midland district, a vacancy was caused by the resignation of a member. In the Scotland district, one of the retiring members was defeated; and, in the Northern district, all four retiring members were returned. In the other two districts, the retiring members were returned unopposed. Mr. W. Gavin, C.B.E., has again been co-opted a member of the Board.

Census of Stocks. A census of stocks on hand with registered producers and authorized merchants at midnight on November 7 has been taken by the Board. A similar census was taken last year.

Sale of "Seconds" Potatoes. The Potato Marketing Board have announced that, as from November 1, registered producers, on making application to the Board, will be granted permission to sell "seconds" for human consumption. "Seconds" are defined as sound, marketable potatoes that have passed through a riddle of 1½ in. and stand on a riddle of 1¼ in. No "seconds" may be marketed unless special labels, to be obtained by the Board, are attached to the bags or other containers used.

Hops Marketing Scheme. An advance of £5 per pocket of sound 1936 quota hops has been made by the Board to growers who have completed their deliveries into approved warehouses. The Board propose to make a further payment to growers as soon as possible after the valuation of the crop has been completed. The quantity of hops sent to the Board reached a total of 148,678 pockets, and the weight is expected to reach the estimated market demand of 225,000 cwt. The quality of the crop is reported to be well up to the average.

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Reports on Schemes under Agricultural Marketing Acts.

A Report on Agricultural Marketing Schemes for the year 1935 (Cmd. 5284) has recently been issued by the Ministry and the Scottish Office. The Report describes the operation of the eight schemes in force in Great Britain during that year, and also the steps taken in connexion with other schemes submitted to the Minister but not in force. A large quantity of statistical material regarding the schemes is made generally available for the first time, and the accounts of the Boards are printed as an appendix to the Report by arrangements with the Boards concerned. The Report shows that the acreage under hops, sales of bacon pigs and the production of bacon, and sales of milk, all increased during the year.

A separate report on Development Schemes (Cmd. 5285) contains an account of the operation of the Bacon Development Scheme. The Board's powers in relation to the licensing of bacon factories are described, and it is stated that in 1935 licences were granted to 579 curers, covering 3,058 premises in which bacon was produced during the six months ended May 17, 1935. A few licences were also granted in respect of new premises or new parts of existing premises.

Both reports may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. The price of the Report on Marketing Schemes is 2s., post free 2s. 2d., and of the Report on Development Schemes, 2d., post free 2½d.

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	1936 April 1 to Oct. 31	1935 April 1 to Oct. 31	Sept. 1, 1934* to Oct. 31, 1936
Payments	£2,269,261	£2,194,880	£8,166,617
Animals in respect of which payments were made ..	976,563	929,982	3,453,621
Average payment per animal	£2 6 5½	£2 7 2	£2 7 3
Imported animals marked at ports (Great Britain only)	327,751	237,695	†1,076,596

* Commencement of subsidy payments.

† As from August 6, 1934.

MARKETING NOTES

Regulation of Imports of Meat, July-September, 1936.

The following statement shows imports of meat from foreign countries in July-September, 1936, compared with the allocations; and imports from Empire countries, of beef and veal and frozen pork in the third quarter compared with the agreed maxima for the second half of the year, and of mutton and lamb in the first nine months of the year compared with the agreed maximum for the year as a whole:—

	Empire Countries '000 cwt.		Foreign Countries '000 cwt.	
	Agreed maxima July-Dec.	Imports July-Sept.	Allocations July-Sept. July-Dec.	Imports July-Sept.
Chilled Beef ..	2,134	1,081	1,988	2,007
Frozen Beef and Veal ..			260	192
Frozen Mutton and Lamb ..	Jan.-Dec. 5,650	Jan.-Sept. 4,032	July-Sept. 263	253
Chilled or Frozen Pork	July-Dec. 288*	July-Sept. 69	July-Sept. 96	68

Supplies and Prices of Early Potatoes in 1936: *Home Supplies.* The area under early potatoes (both first and second earlies) in Great Britain showed a further reduction in 1936 and amounted to 103,769 acres as against 112,186 acres in 1935 and 125,359 acres in 1934 (according to the Potato Marketing Board's returns of holdings of one acre or more). No estimates of the yield of early potatoes are available, but there is evidence that, in spite of the decrease in acreage, the 1936 crop was above the average and considerably greater than that of the previous season. The home crop as a whole reached the market at an earlier date than in 1935, but marketing was very irregular as lifting was frequently interrupted by rain. Supplies often exceeded requirements, however, with a depressing effect on prices, and the market was further congested by the overlapping of first earlies by second earlies and also by immature maincrop potatoes.

Imported Supplies. Imports of early potatoes from the Irish Free State and foreign countries were regulated under

* Includes one-half of the allocations for baconer carcasses to Australia and New Zealand for the year 1936.

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the Potato (Import Regulation) Order, 1934, as in the previous season. The arrangements made under the Order are intended not only to limit imports to the needs of the market, but also to regulate the period of marketing so that the markets shall not be overloaded when home-produced and Channel Islands supplies become available. With this object in view it is provided that the bulk of licensed imports must be brought in before the end of May. The quota for February-May, 1936, was originally fixed at 72,000 tons, but it was subsequently increased to 90,000 tons in prospect of a shortage of maincrop supplies at the end of the season. Imports in the three months June, July and August were limited to 18,000 tons, the bulk of this quantity being allotted to the month of June. Total imports under licence during the whole season amounted to 104,500 tons as compared with 90,400 tons in 1935.

Imports from the Channel Islands, which form the bulk of the unregulated supplies, were considerably smaller than in 1935 owing to unfavourable weather conditions which both retarded and lessened the crop. This decline in Channel Islands supplies more than offset the increase in imports from the Irish Free State and foreign countries, and there was a net decrease of some 6 per cent. in total imports.

Imports from all sources in 1934, 1935 and 1936 were as follows:—

	1934 <i>tons</i>	1935 <i>tons</i>	1936 <i>tons</i>
Irish Free State and Foreign Countries ..	77,250	90,400	104,500
Channel Islands	65,150	85,300	60,200
Other Empire Countries	1,500	1,300	1,700
TOTAL	<u>143,900</u>	<u>177,000</u>	<u>166,400</u>

The Channel Islands, and Spain and the Canary Islands were again the chief sources of imported supplies. The Channel Islands' share of our total imports, however, fell from 45 per cent. in 1934 and 48 per cent. in 1935, to 36 per cent. in 1936, whereas the proportion supplied by Spain and the Canaries rose from 46 per cent. in 1934 and 45 per cent. in 1935, to 59 per cent. in the past season.

Prices. Prices of Spanish and Canary Islands potatoes at the beginning of the season were similar to those ruling in 1935, but later they tended to fall somewhat below the 1935

MARKETING NOTES

level. The small Jersey crop as a whole fetched considerably higher prices than in the previous year, but the arrival on the market of home-produced supplies in the latter part of June caused a sharp general decline. Prices of home-grown earlies throughout the season were lower than in 1935. The following table shows the seasonal average wholesale prices per hundredweight of first and second quality new potatoes at large town markets in the past three seasons:—

<i>Variety</i>				1934	1935	1936*
				<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Jersey (average price in June) ..				14 3	19 3	21 3
Spanish				18 6	20 3	19 0
English :						
Duke of York				9 0	8 3	7 6
Epicure				7 0	6 3	5 9
Sharpe's Express				8 6	9 0	6 9

* Provisional figures.

Regulation of Imports of Processed Milks. Imports of processed milks in July-September, 1936, together with the allocations made to foreign exporting countries and the Irish Free State and imports from other Empire countries in the corresponding months of the two previous years are shown in the following table:—

Source	Condensed Skimmed Milk	Condensed Whole Milk	Milk Powder	Cream
	'000 cwt.	'000 cwt.	'000 cwt.	'000 cwt.
Foreign Countries :				
Allocations	305	82	30	10
Imports	349	50	6	11
Irish Free State :				
Allocations	21	5	—	25*
Imports	23	6	—	14
Other Empire Countries :				
Imports—				
July-Sept., 1934 ..	—	55	18	—
„ 1935 ..	—	39	22	—
„ 1936 ..	—	42	18	—

* Allocation for the six months, July to December, 1936.

NOTE.—Excess imports of condensed skimmed milk from foreign countries are due to the carry forward of deficiencies from previous periods.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances

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made by the Ministry up to November 15, 1936, in respect of manufacturing milk were as follows:—

Section of Act		Period of Manufacture	Gallons	Amount
	<i>(a) Milk Marketing Board for England and Wales.</i>			£
1	In respect of milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936		
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	460,655,507	2,137,278
3	Made into cheese on farms ..	April, 1934, to June, 1936	2,573,662	12,850
			36,055,516	187,463
	* Total for England and Wales ..		499,284,685	2,337,591
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Aug., 1936		
			57,209,282	351,868
	TOTAL ..		556,493,967	2,689,459

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Milk-in-Schools Scheme. Exchequer contributions up to November 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 42,437,312 gal. of milk to school-children at reduced rates during the months October, 1934, to August, 1936, amounted to £777,751. From October, 1935, to August, 1936, 19,585,870 gal. of milk were consumed as compared with 20,867,541 gal. in the corresponding months of the first year of the Scheme. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5.93 pence per lb. for the month of November, 1936.

Wheat Act, 1932 : *Sales of Home-grown Wheat, Cereal Year, 1936-7.* Certificates lodged with the Wheat Com-

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mission by registered growers during the period August 1 to November 6, 1936, cover sales of 6,317,636 cwt. of millable wheat as compared with 11,961,973 cwt. in the corresponding period (to November 8) in the last cereal year.

Deficiency Payments. The Wheat Commission have announced that they have decided not to make during the present autumn an advance payment to registered wheat growers on account of deficiency payments for the cereal year 1936-37. During the past four years, the Commission have, under power given them by the Wheat Act, 1932, and the Wheat Byelaws, generally made payments on account in November and December and at certain dates later in the cereal year. The decision not to make payments this autumn is due to the present level of wheat prices.

New Quota Payments Order. The Minister, in pursuance of the powers conferred upon him by the Wheat Act, 1932, and on the recommendation of the Wheat Commission, has made the Wheat (Quota Payments) No. 3 Order, 1936 (Statutory Rules and Orders, 1936, No. 1149), prescribing that the amount of the quota payment which every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of deliveries of flour during the period commencing November 1, 1936, shall be 4·8 pence per cwt. (equivalent to 1s. per sack of 280 lb.). This Order supersedes the Wheat (Quota Payments) No. 2 Order, 1936, under which the quota payment has been 9·6 pence per cwt. (2s. per sack of 280 lb.) since August 9, 1936. The new rate is the lowest since the Wheat Act came into force.

Sugar-Beet : Contracts for the Purchase of the 1937 Crop. The Sugar Commission issued the following statement on November 10 :—

Section 5 (1) of the Sugar Industry (Reorganization) Act, 1936, requires the British Sugar Corporation Ltd. (a company formed by the amalgamation of all the companies previously engaged in the manufacture of sugar from home-grown beet) to enter into contracts for the purchase of sugar-beet upon terms and conditions agreed between the Corporation and the representatives of sugar-beet growers, or where agreement is not reached, upon such terms and conditions as may be determined by the Sugar Commission.

In accordance with this procedure, the Commission has made an Order determining the terms and conditions of the contracts for the purchase of sugar-beet of the 1937 crop delivered to English factories. The Order fixes prices for beet delivered at the factories named, as in the table on p. 884. (The corresponding prices for 1936 are shown in brackets.)

As in 1936, the prices quoted relate to beet properly topped and washed, having a sugar content of 15½ per cent., and are subject to an addition or deduction of 3d. per ton in respect of each 0·1 per cent. by which the sugar content is greater or less than 15½ per cent.

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Factory				Beet Price per ton	
				1937	(1936)
				s. d.	s. d.
Cantley	36 0	.. (35 0)
King's Lynn	36 0	
Wissington	36 0	
Bardney .. ..	..	..	..	36 6
Bury St. Edmunds .. ..	..	..	..	36 6
Ely .. ..	..	..	..	36 6
Felstead .. ..	..	..	..	36 6
Ipswich .. ..	..	..	..	36 6
Peterborough .. ..	..	..	..	36 6
Spalding .. ..	..	..	..	36 6
Colwick	37 0	.. (36 0)
Kelham .. ..	..	..	..	37 0
Allscott .. ..	..	..	..	37 6
Brigg .. ..	..	..	..	37 6
Kidderminster .. ..	..	..	..	37 6
Poppleton .. ..	..	..	..	37 6
Selby .. ..	..	..	..	37 6

Special claims were made by growers in areas distant from any factory to be relieved of some part of their freight charges. It appears to the Commission that this question is closely linked up with the questions of factory siting and capacity, on which further investigation is required. Pending the result of those inquiries, and without prejudice to future policy in this respect, the Commission has decided that for the 1937 season the Corporation shall defray railway freight charges in excess of 7s. per ton on all sugar-beet accepted by the Corporation for delivery to the factories at Allscott and Kidderminster.

In other respects the conditions of the contracts for 1937 will be identical with those for 1936, with the exception that the preferential price for pulp sold by the Corporation to growers is fixed at £4 15s. per ton gross. After allowing for the usual rebates the net prices to the growers will be £4 5s. per ton for pulp delivered in October, 1937; £4 7s. 6d. in November, 1937, and £4 10s. in December, 1937.

The Commission's Order does not deal with the terms of the contracts for beet consigned to the Scottish factory at Cupar, which are the subject of separate negotiations between the Corporation and the growers' representatives.

The Corporation and representatives of growers for the Cupar factory have subsequently, after consultation with the Commission, agreed that the price for beet of the 1937 crop for that factory shall be 35s. 6d. per ton f.o.r. (compared with a corresponding price of 34s. per ton for 1936), subject to the proviso that the Corporation does not accept liability for railway freight charges in excess of 10s. per ton. Pulp prices will be the same as for the English factories.

Production of Home-Grown Beet Sugar during 1936-37 Campaign. According to information furnished by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during October, 1936, and the corresponding month in 1935, were:—

			White cwt.	Raw cwt.	Total cwt.
1936	1,422,223	1,159,698	2,581,921
1935	1,236,244	1,616,723	2,852,967

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The total quantities of sugar produced to the end of October in each of the two manufacturing campaigns were :—

	<i>White cwt.</i>	<i>Raw cwt.</i>	<i>Total cwt.</i>
Campaign, 1936-37	1,422,223	1,159,698	2,581,921
„ 1935-36	1,315,712	1,666,771	2,982,483

National Mark Lists of Authorized Packers and Approved Retailers. The Ministry has compiled and issued lists of authorized packers of National Mark commodities. The lists include packers of eggs, dressed poultry, cheese, creamery butter, wheat flour, wheat flakes, malt products, canned and bottled fruit and vegetables, cider, perry, fruit juices, honey and jam. These lists are given in Marketing Leaflet 57B. The authorized packers and registered wholesale distributors of fresh fruit and vegetables are given in Marketing Leaflet 57A.

National Mark commodities are now found in most high-class shops throughout the country. With the object of securing a greater measure of support from the retail trade, and the most effective use of National Mark publicity, the Ministry has issued a preliminary list of retailers who have applied for enrolment as approved distributors of National Mark produce and who have undertaken to co-operate with the Department in maintaining the quality standards at the point of retail sale. This list (Marketing Leaflet 62), which includes retail distributors of most of the commodities included in Marketing Leaflet 57B, has been drawn up with the assistance of the National Federation of Grocers' and Provision Dealers' Associations and the Parliamentary Committee of the Co-operative Congress.

A roll of retail distributors of National Mark beef is already in existence, and the Retail Fruit Trade Federation is at present considering the possibilities of establishing an approved list for the fruit and vegetables trade.

The National Mark is the Registered Certification Trade Mark of the Minister and differs from commercial brands in that the use of the Mark implies conformity with legal standards of quality (which are available to all to consult) and impartial supervision of quality by the Department.

Canned Fruit and Vegetables. The substantial clearance of stocks of canned fresh fruits and vegetables during the winter of 1935 and the spring of 1936 encouraged a revival

MARKETING NOTES

of activity in English canneries. In 1936, supplies of the various raw fruits were, with a few exceptions, much in excess of those available in 1935, whilst, despite a reduced rate of yield, the larger acreage of peas grown under contract in 1936 for canning purposes enabled canners to increase their output of canned fresh-picked peas.

Wet weather during the soft-fruit and pea seasons hampered a steady flow of supplies. Difficulty was experienced in handling the large crops of plums, owing to the rapidity with which each variety matured as a result of a warm spell of weather at the end of August. Critical examination of the various fruit packs shows, however, that, despite these drawbacks, National Mark canned fruit and vegetables this year, are well up to the usual high standard.

Further, the packs, although larger than in previous years, are being disposed of more rapidly through distributive channels, a number of canners having already sold their entire stocks of certain packs.

The number of authorized canners working under the Scheme is now 36, and the number of factories 46. The larger canners are strengthening their sales organizations, and the extension of the canning campaign by the packing of non-seasonal products, such as processed-dried peas and fruit salads, has helped to reduce overhead costs. These factors are helping to put the English canning-industry, which is already an important outlet for English fresh fruits and vegetables, on a sounder basis and make it capable of absorbing increased quantities of home-grown produce.

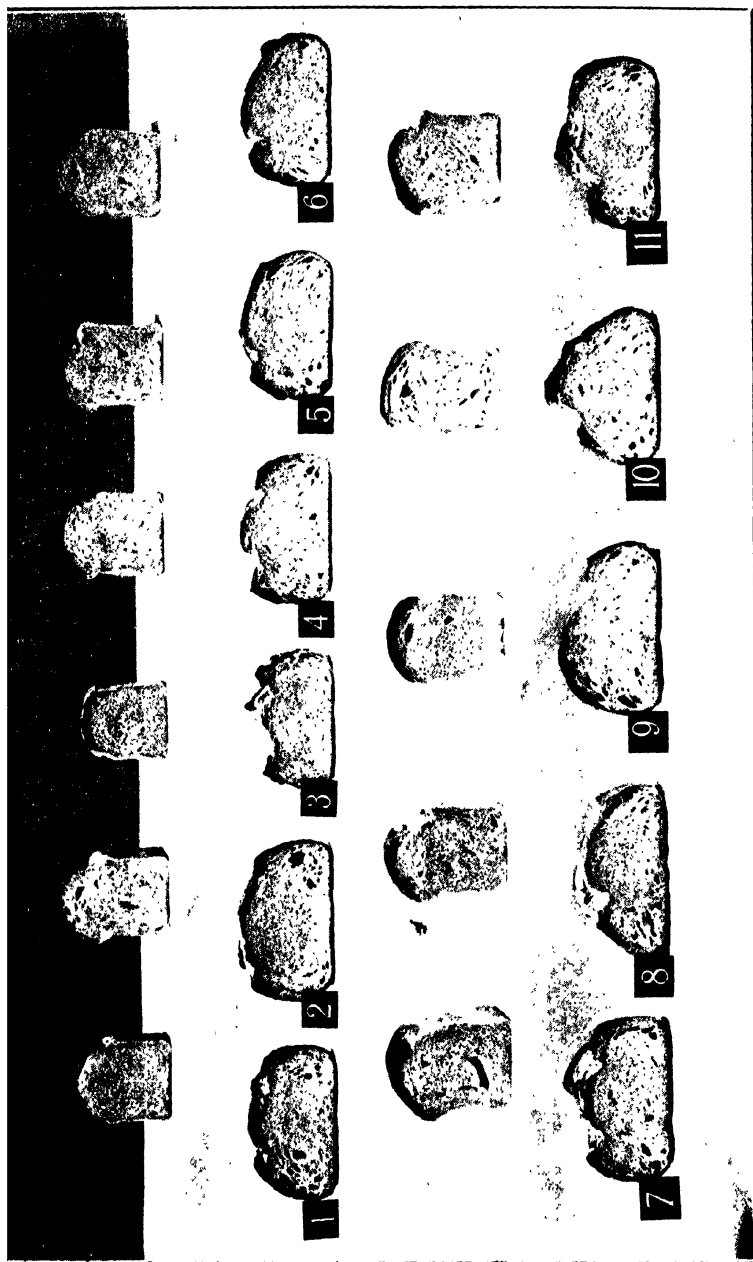
Cheese. By arrangement with the show authorities concerned, the exhibits of cheese entered by authorized National Mark packers in open classes at the following four shows this year were graded by the graders officially appointed under the National Mark Caerphilly and Lancashire cheese schemes:

<i>Shows</i>	<i>Awards</i>
Highbridge Show	First, second and third in the open class (for Caerphilly cheese). First and second in the rennet class (for Caerphilly cheese).
Royal Lancashire Show ..	First, second and third (for Lancashire cheese).
Goosnargh and District Show ..	First and third (for Lancashire cheese).
Garstang and District Show ..	First, second and third (for Lancashire cheese).



Bread-making Tests, carried out at the National Bakery School, with samples of National Mark All-English (Yeoman) Straights flour, milled from 1930 crop wheat harvested before the end of August. The Test loaves uncut.

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Bread-making Tests, carried out at the National Bakery School, with samples of National Mark All-English (Yeoman) Straight flour, milled from the 1930 crop wheat harvested before the end of August. The Test loaves cut.

MARKETING NOTES

At the London Dairy Show in October, authorized packers of National Mark cheese were successful in obtaining the first, second, third and reserve awards for Wensleydale cheese, and the first, second and third awards for Stilton cheese.

Home-grown Wheat Flour for Bread-making. The National Bakery School has conducted bread-making tests with 11 samples of National Mark All-English (Yeoman) Straights flour, milled from 1936 crop wheat harvested before the end of August. The flour was supplied by millers in different parts of the country, and, with one exception, satisfactory bread was produced from the samples tested. Photographs of the test loaves are shown on the accompanying inset. The following are the main observations taken from the Director's report:—

1. Most of the flours possessed a good colour and produced bread with a good creamish colour; the greater uniformity of crumb colour was most marked this year.
2. All the flours produced stable doughs with the equivalent of $14\frac{1}{2}$ gallons of water per sack. During fermentation all the doughs gassed well and the majority of them possessed good stability.
3. Following the practice of previous years, the process employed was of $2\frac{1}{2}$ -hour dough time. With one exception, good bread was obtained in all cases. The total length of the bread-making process was approximately $4\frac{1}{2}$ hours from start to finish.
4. As will be seen from the illustrations, all the flours with one exception produced bread of good volume, particularly producing bold oven bottom loaves.
5. Flour of the quality of the samples examined would be quite suitable for blending with stronger flour in the bakery.

Copies of Marketing Leaflet 12E, giving the recipe for using National Mark flour in commercial bread-making, may be obtained from the Ministry free of charge.

Spread of the National Mark Movement: Union of South Africa.—The Government of the Union of South Africa has notified its intention of introducing a national mark scheme in respect of meat, eggs, oranges, grape fruit, potatoes, onions, grapes, pears, peaches and apples offered for sale. A start is to be made on the Johannesburg market.

The scheme is voluntary and is similar to that in this country, three or four grades being prescribed by statute for each kind of produce.

The grade marks and the national-mark labels are applied by producers, in the same way as in this country, but the Johannesburg scheme differs somewhat in that all the produce is inspected before sale by Government inspectors. Produce that is not up to the standard indicated by the grade mark on the package may be marked down to a lower grade (or entirely rejected) by the inspector.

DECEMBER ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

To the younger generation, December is primarily the month in which Christmas comes and is associated with holidays and some degree of festivity. The extent to which townsmen can completely abandon the normal activities and take a real holiday arouses even more envious feelings in the minds of the farm staff than difference in pay and hours. On 366 days this year, cows will have had to be milked and other stock will have had to receive varying degrees of attention. On a large farm, a system of weekly holidays can be arranged, but the average British farm is comparatively small, and it is very difficult to arrange for holidays. The most that can be done is to suspend working in the fields, and only to deal with what is necessary for the well-being of the live stock. One can only express the hope that some day the profits from farming may be such as to allow of the employment of an additional handyman, one of whose functions would be to relieve the other workers in turn for weekly and annual holidays.

Meanwhile, it is some consolation to reflect that, although conditions of farm workers compare unfavourably in this respect with town workers, they are, at any rate, much better than formerly. A colleague relates how he entered into conversation with an old man on a walk across the Yorkshire Wolds a few years ago. He had gone out to his first "place" when 12 years old, at a wage of £2 10s. *od.* a year, living in. He had one day's holiday a year to attend the Martinmas Fair in the nearest market town. The second year, he took a day's holiday during the year to visit his mother, who was ill, and as a result his one holiday was stopped. All this was stated without any feeling of resentment: "Mr. — was a good master and I stopped with him five years. He was a rare good farmer, too, and we all had to work hard."

The last remark leads one to consider the factors that make for a contented staff, and the opinion may be hazarded that one of the most important is that the farmer must really know his job, and plan out work in a methodical way. Nothing tends to make a good man more disgruntled than the feeling that his labour and skill are not being effectively and fully utilized. The long evenings give opportunities for planning

DECEMBER ON THE FARM

and deciding on policy for the coming season, as well as for arranging details of all the odd jobs that ought to be dealt with in the dead of winter when bad weather or frost restricts activities in the field.

As usual, wiseacres have predicted a hard winter. They are bound to be right some time. Except to the arable farmer with heavy clay land, a mild winter is so welcome that when their prophecies go wrong they are forgiven or forgotten. In any event, it is well to remember what the makers of Christmas cards forget—that hard weather rarely sets in until after the New Year. The severe and prolonged frost of 1920, for instance, did not begin until nearly the middle of February.

By the end of the year, ploughing should be well advanced, and a considerable area ready to benefit by any frosts that do occur.

Beef. Losses or no losses, December is the beef man's month. In addition to the more important exhibitions of fat stock at the London Smithfield, Birmingham, Norwich, York and Edinburgh, there is an "annual prize sale of fat stock" at practically every auction mart. Great interest is shown in the championship competitions at these local sales, and cheap transport has encouraged many enthusiastic feeders to send exhibits far afield. To attempt to discuss the utility of such competitions would only reveal a lack of understanding of such occasions, and failure to realize that there is more in farming than making money and producing efficiently.

The rather high prices for store cattle, coupled with the high-price level for all feeding stuffs, cause the feeder to think anxiously of the future. A few feeders of the older generation, exchanging reminiscences the other day, expressed the opinion that, although the modern feeder does not value farmyard manure as much as his predecessors did, he was actually forced to pay more for it, because of feeding losses. The feeders in question recalled the old custom whereby many Lincolnshire and Norfolk feeders were supplied with cattle, cotton and linseed cakes, by Northamptonshire men. The feeders delivered up the cattle in the spring, when they would be ready for the pastures in Northamptonshire. The feeders thus got their straw made into manure for the cost of tending the cattle, and without any capital outlay; the graziers got stores purchased at low autumn-prices, cheaply wintered, and in just the right condition in spring for going

right ahead on the pasture. They were thus able to take full advantage of the early grass and be ready for sale in July before prices dropped.

The question of quality in relation to carcasses is one much discussed at this time of year; those who are able to visit the Carcass Competition of the Smithfield Club have a splendid opportunity of examining carcasses that have been put in order of merit by the judges. A recently issued leaflet of the Ministry of Agriculture and Fisheries, Marketing Leaflet No. 75, entitled "Fat Stock (August, 1936)" can be recommended, not only to those who are interested in the sale of fat stock on a dead-weight and quality basis, but to all feeders. A scheme is described for selling from farms to wholesale meat-markets under forward quotations, based on carcass-grade and weight; during 1935, the number of cattle sold under this scheme amounted to 10,573, sheep to 27,669 and pigs to 7,262. The various classes and grades are defined and well illustrated by photographs. There is also a list of centres from which quotations may be obtained, and also the arrangements made for insurance under the scheme.

In Aberdeenshire, noted for the quality of its fat cattle, the diet consists mostly of fresh oat-straw, threshed once a week or even every morning, a liberal quantity of swedes, and concentrates; 4 parts of bruised oats and one of linseed cake is a popular mixture of concentrates. Though the quality of Aberdeenshire beef is generally associated with the breeding of the animals, the large quantities of swedes and turnips used are claimed by many to have much to do with it. In the East of Scotland, larger allowances of succulents are used, and a 9-cwt. bullock may get up to $1\frac{1}{4}$ cwt. of turnips.

As regards rate of fattening, Mr. Raynes, who has a large experience of experimental work in this branch of farming, considers that it is more economical to feed steers to put on 2 lb. than $2\frac{1}{2}$ lb. a day. It is probable that steers differ in this respect, and that a few would repay feeding up to $2\frac{1}{2}$ lb. or even 3 lb. a day, just as some cows will repay high feeding. Individual attention would be essential for that. To revert to Aberdeenshire, it has been suggested that the system of tying up the cattle, though it has the disadvantage of a higher labour cost, develops a type of cattleman who takes an individual interest in his animals, and who can feed the good-doers accordingly.

In discussing the fattening of cattle, one is rather apt to

overlook the fact that such a large proportion of home-fed beef comes from fat cows. Those fattened off in winter generally get the same fare as the rest of the dairy herd. Owing to the low price of cow beef, those that do not fatten readily are sold for "what they will make."

The use of roots in any great quantity for dairy cows is often hotly disputed, with the usual result of leaving the respective supporters of opposed views more convinced than ever of their soundness. As assisting the side that, in these days, appears to be having the worse of the argument, a colleague mentioned recently that the most impressive results, both by way of milk records and financial returns he had seen for a long time, were those of a large milk-producer in the East of Scotland, who gives his cows practically unlimited swedes—probably about a cwt. a day, and an average of only 6 lb. of concentrates.

Folded Sheep. Lambing begins in many flocks this month. At the time of writing, both the autumn weather and the trend of prices promise well for the coming lamb-crop. To look further ahead, one may add that it is not without misgiving that one observes the interest shown abroad in English breeds suitable for fat-lamb production. The recent visit of a British expert to South America to judge carcasses pleases us in one respect, but is a sign that one may expect the "fight" to stiffen before long.

In selecting concentrates for the flock, manurial values receive due consideration. Recent experiments suggest that foods that are not so rich in nitrogen may often give results that are better than what is anticipated.

Thus, in the recently issued Rothamsted Annual Report for 1935 (Rothamsted Experimental Station, Harpenden, 2s. 6d.), an experiment is described in which the manurial value of foods fed to sheep is measured in terms of crop increase. The trial was carried out at Woburn, where the soil is light. Twelve tons per acre of the swede crop were fed off by sheep. One lot received, in addition to the swedes, a mixture of linseed and cotton cakes at the rate of 15 cwt. per acre, supplying 78 lb. of nitrogen; the other lot received the same weight of a mixture of oats, wheat and barley, supplying 26 lb. of nitrogen. Barley (Plumage Archer) was drilled early in March, and the yields of grain and straw from the crop were determined. After cake feeding, the yield was 38·7 bus., while, after the cereal mixture, the yield of grain

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was 32·5. In the report it is stated that the higher yield after the cake mixture is in accordance with previous results, but that it was remarkable that the corn plot, which received only 26 lb. nitrogen in the four years' rotation, should give so good a result, and one so nearly approaching that from the higher application.

Grass Land. The winter months are suitable for work on grass land, and enable the pasture to be put into a productive condition in time for the next grazing season. The type of tillage operation needed depends on the state of the surface. If no more is needed than tearing up the mat, the grass harrows sold for the purpose, or a weighted set of sharp-tooth-harrows, enable this to be done efficiently. It is advisable to graze well before operations are carried out on grass land. If deeper cultivation is necessary, in order to get at the root system of the herbage, implements like the Wilder Pitchpole harrow, or Bamfords' self-cleaning harrow, give excellent results. In some districts, as in parts of Herefordshire, it is possible to get land cultivated in both directions with the Wilder for 6s. per acre. The Bamford is a more recent implement. It is designed to work in one of three depths, and its action is such that, when the tines are raised for passing through the grid for cleaning, another set enters the ground; in this way, no part of the ground is left untilled. If there is much rubbish, it is advisable to collect it with a horse rake, or it may damage the turf.

The benefit from such deep-pasture cultivation follows, not only from the breaking up of the mat, but also from the effect on the rooting system. The roots are induced to send up a number of vegetative buds and tillers, instead of the flowering stems, which are of less value in the formation of a good pasture; it may be mentioned, incidentally, that one of the factors responsible for the high value of indigenous grasses is their propensity for forming vegetative tillers rather than flowering stalks. It is often advisable to follow pasture cultivation by a renovating mixture of grass and clover seeds, particularly where there is but little perennial ryegrass and wild white clover. Although the end of March is generally considered the most suitable time for sowing such mixtures, good results may follow such work in December; an instance of the beneficial results of sowing wild white clover in December is given in the *Scottish Journal of Agriculture* for

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October, 1935. There is nothing to be gained by including a large number of species in renovating mixtures. Wild white clover and perennial ryegrass may be used, with the possible addition of rough- and smooth-stalked meadowgrass, timothy and cocksfoot.

The pasture is in a suitable condition for manuring after grazing bare and cultivating the surface. Should there be a possibility that lime is required, the Advisory Agricultural chemist should be consulted. Should some form of basic slag be decided upon, this should be applied as early as possible in the winter. Experiments carried out from Rothamsted, under the ægis of the Ministry of Agriculture Basic Slag Committee, show the superiority of high-soluble basic slag over other forms, although the low-soluble slag and mineral phosphate both have value in certain conditions; in the counties, it has generally been considered that the latter gives good returns in districts of adequate rainfall. It appears, from the 1935 Rothamsted Report, that the investigations have already had the useful result of increasing the proportion of agriculturally effective slags; thus, in 1934-35 the percentage of total deliveries of slag represented by the high-soluble type (80 per cent. or more) amounted to 72·4 per cent., as against 51·8 per cent. in the year 1924-25.

December Harvest : Reeds. There is a revival of interest in thatching because of the demand for thatched roofs for many modern houses. It is doubtful whether it is a sincere form of art to build in one century according to the style of another; in walking through an old Wiltshire or Devon village, one can, however, see that, since building must be done, there is much to be said for building in harmony with the existing dwellings.

Reeds for thatching are collected in December, by which time frost should have taken off the leaves; cutting is continued until the end of March or early April, when the young shoots appear. It should, perhaps, be mentioned that in some parts, as in Somerset, the term " reeds " when applied to thatching means unthrashed straw, the ears from which have been cut off for thrashing separately, and the leaf blades and sheaths stripped off. Large quantities of reeds are harvested from the Norfolk Broads and the sides of the waters of Suffolk; Mr. Farman, the well-known Norfolk reed-thatcher, considers that the reed thatch probably originated in East Anglia.

NOTES ON MANURING

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Liming. When studying reports of agricultural surveys, the reader cannot but be struck by the frequency with which lime deficiency is mentioned as a serious trouble in the area surveyed. Despite the futility of attempting to grow many of the common agricultural and horticultural crops on lime-deficient soils, there is much evidence pointing to soil acidity as still being one of the major factors limiting the productivity of large areas of land in this country. The subject has received so much attention and publicity in the past that further reference to it might be considered to be, and indeed should be, unnecessary. Surely every farmer and landowner must be familiar with the troubles that arise from lime-deficiency, at least from hearsay if not from bitter experience. If this is so, however, then there are surprisingly many farmers who, whilst suffering serious loss from its incidence, have failed to take adequate steps to control the trouble.

In reports of two further surveys that have appeared this year, soil acidity is again shown to be a serious handicap to the farmers of the areas surveyed. One of these surveys, carried out by the Department of Agricultural Economics at the Midland Agricultural College, relates to sand land farming in the Sherwood Forest area of Nottinghamshire. The author of the report refers to the depression in this sand land farming and states that the basis of the improvement of these sand land farms ought to be liming. The following extract is taken from the summary of the report. "At present it is the visible dilapidations that have first claim upon the depleted estate revenues, and the prospective tenant looking for a cheap farm is not over-critical. But very often the most serious dilapidation, the chief underlying cause of the farm poverty, is lime-deficiency, a deficiency not likely to be removed by the type of tenant attracted to a cheap farm, so that the very re-letting often saddles both landlord and tenant with an unprofitable contract."

The second survey was carried out by the Agricultural Organizer for East Suffolk, and covers an area in the south-east of that county. In connexion with this survey a large

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number of soil samples were examined at Cambridge in respect of their lime status, and, in discussing the data collected, the Organizer states that, out of a total area of 16,821 acres classed in the Ministry's returns as being under crops and grass, 7,091 acres (i.e. approximately 42 per cent.) were lacking in lime. This figure includes 1,237 acres (7 per cent.), so seriously lime-deficient that sugar-beet and barley would fail completely in most seasons, and a further 2,549 acres (15 per cent.) on which serious reduction in yield would occur even if complete failure were avoided.

Admittedly these surveys relate to only two districts, but much evidence of a similar nature has been published on previous occasions, and inquiry in many Advisory Provinces will elicit the information that soil acidity is still a common cause of crop failure. At a time when the possibilities of reclaiming or improving land are frequently under discussion, it seems remarkable that more cannot be done to bring back into full productivity those lands that are known to require little more initial expenditure than the cost of a dressing of lime or chalk. The extension of the sugar-beet industry has served to awaken interest in the matter in some parts of the country, but it is no exaggeration to say that every year the yield of sugar on hundreds of acres of land is seriously reduced by soil acidity.

Despite this fact—and there are, of course, corresponding reductions in the yield and quality of other crops such as barley, legumes and brassicae—large quantities of waste lime are still available at many beet-sugar factories. Indeed, the disposal of this waste material is said to be a serious problem for some factories. Is it beyond the ingenuity of the factory and the farmer to secure the dispatch of much more of this lime-sludge to the land that is so badly in need of it? It may be that, to do this economically, the material will eventually have to be dried, but though it is often very wet during the winter and spring, it is dry enough during the summer to be worth while carting within a limited radius of the factory. From 2 to 2½ tons of this sludge, usually to be had for no more than the cost of carting, contains as much calcium carbonate as 1 ton of ground carbonate of lime.

It is not every district that has a beet factory within easy reach, and, unless the sludge can be dried to a fairly low moisture content, it will obviously not be economic to transport it over long distances. There are, however, very few

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districts in this country that have no source of lime within reasonable distance, whether it be chalk, limestone or waste lime. During the last year or two there has been some indication of increased efforts to remedy lime-deficiency, but much remains to be done. Not only is the productivity of the land involved, but also, now that the importance of calcium and other mineral elements in the feeding of live stock is generally recognized, the nutritional value of the produce must not be lost sight of, a point of particular importance in the case of grass land.

To wait until the effect of soil acidity is visible to the naked eye in the form of partial crop failures is obviously unsound, for by that time considerable loss of crop must have been suffered. Sound advice on the liming of land can now be obtained from the County or Provincial Advisory Staffs, and this is one direction in which soil analysis, properly carried out, can be trusted to give reliable results, though "rapid methods for use in the field" are still not to be relied upon when it comes to the question of *how much* lime to apply. This is a point where old ideas may require to be modified in the light of recent discoveries. The decision as to how much lime to apply to a field is not one to be made lightly, for too small a dose may be sheer waste of money if it is insufficient to reduce the acidity to the level at which crops can thrive, whilst if too much is used the remedy itself may prove harmful, for there is evidence that diseases such as grey-speck in oats and heart- or dry-rot in sugar-beet may be caused by deficiencies of the so-called minor elements of plant food such as manganese and boron, brought about by excessive soil alkalinity converting the supplies of these elements in the soil into a form in which they are unavailable to crop plants.

It would obviously be unwise, in the present state of our knowledge, to attach too much importance to the possible harmful effects of over-liming, but, looking at the matter from another angle, direct evidence that doses of lime largely in excess of the actual need of the soil are not always the most economic, is contained in the results of the long-term experiments at Woburn. In a recent account of these experiments it is shown that the rate of loss of lime from the soil is greater when heavy doses are applied than when smaller ones are used. The wisest policy in the long run is to remedy any serious existing lime-deficiency by giving the

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appropriate dressing, based on soil analysis carried out at some reliable laboratory, and to guard against future deficiency by including a small application of lime in the manuring policy of the farm—whether it be grass or arable. Such a scheme has the additional advantages that it maintains the land at a constant level of productivity as far as the lime factor is concerned, and, by making the cost of liming an annual charge, does away with sudden calls for heavy expenditure—which are so liable to upset the farm budget.

Wherever liming is to be done for next season's crop the sooner it is carried out the better. In recent years, especially during dry summers, the writer has come across many instances in which lime applied in February and March had little or no effect on the crop grown in that season, patchiness and stunted growth being almost as prevalent on the limed areas as on control strips left unlimed. Yet the period January to March often produces more inquiries as to the advisability of liming land for that season's crop than any other three months in the year. The need for lime is best judged before the previous crop is harvested—the adviser has then the maximum evidence on which to base his advice and the farmer can get the lime on in time for the next crop to derive substantial benefit.

Manuring for Tomatoes. Growers of glasshouse crops are not alone in their leaning towards phosphatic fertilizers. In the past, market gardeners have used heavy dressings for outdoor vegetable crops, and many vegetable growers still insist on the need for these heavy applications. With tomatoes, however, there is now definite experimental evidence that bonemeal or bone flour at the rate of $\frac{1}{2}$ ton per acre need not be used in the base fertilizer more than once in two or even three years, irrespective of whether the soil has been steamed or not. Potash is probably the most important constituent of any base fertilizer. Not only does adequate potash make for good, healthy growth, but it often helps to counter such troubles as blotchy ripening. Sulphate of potash, at the rate of $\frac{1}{2}$ ton per acre is preferable to other forms of potash in view of the susceptibility of tomatoes to injury from chlorides. The nitrogen in the base fertilizer should be in a slowly available form such as $\frac{1}{2}$ ton per acre of hoof and horn. Nitrogen can often be omitted, however, on new land, and it

NOTES ON MANURING

is usually unnecessary, and may even be harmful, on newly-steamed soil.

It is in the type and frequency of the dressings after planting, however, that the tomato grower can show his real skill in the art of manuring. The composition, and time of application, of these dressings are largely governed by climatic conditions and the growth of the crop. The apparent similarity in the effects of sunshine and potash on the growth of the tomato plant, must be constantly borne in mind. In sunless periods, and during the early part of the growing season, dressings should include a high proportion of potash. Caution is necessary, however, later in the season, and when climatic conditions change, for excess of potash may then prove detrimental to the size and quality of the fruit.

On the other hand, though very little nitrogenous fertilizer is required in the first dressing after planting, which may often consist solely of sulphate of potash at about 5 cwt. per acre, nitrogen should usually be the chief constituent in later dressings.

The inclusion of phosphate in top dressings is by no means universal, but in view of the recently established connexion between the phosphate and potash content of the tomato plant it seems undesirable to omit phosphate altogether, especially in seasons when it is not included in the base fertilizer.

Water Supply for Glasshouses. Reference was made in an earlier paragraph to the harmful effects of chlorides on the growth of tomato plants. The presence of salt or sodium chloride in the water used, for glasshouse crops is not infrequently a cause of serious trouble in districts near the sea coast, e.g., round the Wash. Not only has the presence of chloride a harmful effect on the growth of the tomato plants, but the reaction between the salt and the soil may result, in time, in a serious deterioration in the physical condition of the soil. In view of the frequent occurrence of this trouble in some districts, it is important that growers should realize that no treatment is yet known by which the salt content of brackish water can be reduced to harmless proportions. The only safe course is to be sure, when selecting a site for a glasshouse, that a suitable supply of water is available—unless a site has some special value that will compensate for any disadvantages of the water supply.

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That the tomato plant will readily take up chloride is shown by the following analyses of the "ash" of tomato plants growing on the same holding in houses situated only a short distance apart. House No. 1 was served by a well supplying water containing very little sodium chloride, and house No. 2 by a well supplying water with a much higher salt content.

	<i>House</i> <i>No. 1</i>	<i>House</i> <i>No. 2</i>
	%	%
Cl in water (calculated as sodium chloride) ..	0·004	0·041
Cl in "ash" of leaf stalk, midrib and main		
veins	8·86	22·54
Cl in "ash" of remainder of leaf tissue ..	3·02	13·13

The salty water mentioned in the above table is by no means an extreme case, for other samples examined, from houses where tomatoes have not been progressing satisfactorily have sometimes shown a chloride content equivalent to over 1 per cent. sodium chloride.

PRICES OF ARTIFICIAL MANURES

Description.	Average prices per ton (2,240 lb.) during week ended Nov. 11th.				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:—					
Neutral (N. 20·6%) ..	6 19d	6 19d	6 19d	6 19d	6 9
Calcium Cyanamide (N. 20·6%) ..	6 19e	6 19e	6 19e	6 19e	6 9
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
" " (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½% P.A. 20½%) ..	..	6 10	6 5h	6 10	..
Steamed Bone Flour (N. 3½% P.A. 27½—29½%) ..	5 12	5 10	5 0h	5 0	..

Abbreviations: N. = Nitrogen;

P.A. = Phosphoric Acid;

S.P.A. = Soluble Phosphoric Acid;

Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85 per cent. through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80 per cent. through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra; for lots of 2 tons and under 4 tons, 5s. per ton extra; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons, the price is 5s. per ton extra; for lots of 1 ton and under 2 tons, 10s. per ton extra; for lots of 10 cwt. and under 1 ton, 15s. extra; and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,

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Protein Requirements of the Pig. The general conditions that govern protein requirement and the possibilities of protein storage in the animal body were discussed recently in these notes (July, 1936, p. 389). In dealing with the pig, tentative standards for the optimum protein requirements were given, with the implication that little or no further improvement in either growth-rate or ratio of lean to fat could be expected by raising the protein supply beyond these levels. It was indicated that these standards would be met by rations containing digestible protein ranging from about 17 per cent. for the 30-lb. weaner down to about 10 per cent. for the 210-lb. baconer. These conclusions are now substantially confirmed by experimental work at Cambridge and in Scotland, on which reports have been issued during the past month.

The Cambridge report (*Jour. Agric. Sci.*, Vol. XXVI, Oct., 1936, pp. 546-619) is of particular interest since it represents the most precise and comprehensive investigation of the subject ever carried out in this country. It furnishes also an impressive example of the great wealth of data of interest that can be derived from feeding experimental work when the nutrition expert, statistician and meat specialist join forces for the investigation.

In this work, carried out by Dr. Woodman and his colleagues, the results obtained at three different levels of protein supply were compared, using both individual-feeding and group-feeding methods. In each instance the feeding period (112 days) was divided into three stages, the rations being varied when the pigs reached 90 lb. live-weight, and again at 150 lb. live-weight. In group feeding, the average live-weight of the group was taken for this purpose. The rations used are set out below in parts by weight, the terms Normal Protein, Higher Protein, and Highest Protein being used to describe the three treatments compared.

NOTES ON FEEDING

	<i>A.</i> <i>Normal</i> <i>protein</i>	<i>B.</i> <i>Higher</i> <i>protein</i>	<i>C.</i> <i>Highest</i> <i>protein</i>
<i>Up to 90 lb. L.W.</i>			
Barley meal	55	45	35
Weatings	31	31	31
Lucerne meal	2	2	2
White fish meal	12	12	12
Meat meal	—	5	10
Extracted soya meal	—	5	10
Per cent. crude protein in ration	17.48	22.13	26.77
<i>90 to 150 lb. L.W.</i>			
Barley meal	65	55	45
Weatings	23	23	23
Lucerne meal	2	2	2
White fish meal	10	10	10
Meat meal	—	5	10
Extracted soya meal	—	5	10
Per cent. crude protein in ration	15.93	20.58	25.22
<i>150 lb. L.W. to slaughter.</i>			
Barley meal	80	70	60
Weatings	13	13	13
Lucerne meal	2	2	2
White fish meal	—	—	—
Meat meal	2½	7½	12½
Extracted soya meal	2½	7½	12½
*Minerals	1	½	—
Per cent. crude protein in ration	12.25	16.94	21.66

* Composed of 1 part by weight of common salt to 3 parts
of ground chalk.

It will be noted that the increases of protein content were effected by the replacement of part of the barley meal by an equal weight of meat meal and soya meal in equal parts; and that the proportion of total "protein concentrates" in the rations ranged from ~~12~~ to 32 per cent. in the first period, from 10 to 30 per cent. in the second, and from 5 to 25 per cent. in the third period. The effect of these differences upon the protein contents of the rations as a whole is also shown, these ranging roughly from 17 to 27, 16 to 25, and 12 to 22 per cent. respectively in the three periods.

Apparently the high protein rations were consumed as freely as the control rations and without any outward symptoms of detriment to the pigs.

Ten pigs were placed upon each treatment, both in the individual-feeding and in the group-feeding tests, every precaution being taken to ensure as nearly as possible an ideal lay-out in the distribution of the pigs between the different treatments.

NOTES ON FEEDING

The pigs were the progeny of eight pure-bred Large White sows from the University Farm, and did not vary in age more than ten days. In the individual-feeding test the range of age was only four days. At the commencement of the experiment proper, the range of live-weights in the individual-feeding test was from 28½ lb. to 50½ lb., and in the group-feeding test from 28 lb. to 59 lb.

In view of the complexity of the experiments it is clearly impossible to give more than a very imperfect summary of the results here, but the averages tabulated below give a fair indication of the general character of the results obtained with respect to growth-rates and efficiency of utilization of food.

<i>Treatment</i>	<i>Individual-Feeding</i>		<i>Group-Feeding</i>	
	<i>Mean L.W.I.</i>	<i>Mean lb.</i>	<i>Mean L.W.I.</i>	<i>Mean lb.</i>
	<i>per day</i>	<i>Meal</i>	<i>per day</i>	<i>Meal</i>
		<i>per 1 lb.</i>		<i>per 1 lb.</i>
		<i>L.W.I.</i>		<i>L.W.I.</i>
	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>
A	1·35	3·33	1·27	3·62
B	1·31	3·42	1·26	3·60
C	1·27	3·46	1·18	3·78

The differences in every instance are quite small as compared with the range of variation in the data for the individuals on any one treatment, and even in the earliest period (up to 90 lb. L.W.), when any influence of extra protein in improving the rate of growth might have been expected to be most clearly shown, there was no evidence of any such effect.

One can only conclude, therefore, that, under the conditions and with the rations used in these experiments, the very large increase in protein supply had very little effect on the progress of the pigs, whether measured in terms of rate of live-weight increase or efficiency of food conversion.

It is of interest to note, indeed, that both the growth-rate and the food factor tended to deteriorate slightly as the protein supply was increased, a phenomenon that was shown at all stages in the individual-feeding test, and in the main also in the group-feeding test. The small drop in rate of live-weight increase shown above between the A and C averages was definitely due to the different treatments, but probably finds its explanation in a slight lowering of the net energy (starch equivalent) of the C rations rather than in any direct effect of the excess protein.

That a considerable proportion of the extra protein fed in Treatments B and C was not being stored as such in the

NOTES ON FEEDING

pigs' bodies, but was being broken up ("deaminated") and the surplus nitrogen removed in the urine, found probable confirmation also in the observation that the water consumption of the pigs on these diets was considerably increased.

It is further recorded that the pigs showed no notable differences of shape and conformation as between one treatment and another, such as might have been expected if there had been considerable differences in the ratio of protein (lean meat) storage to fat production.

Turning aside for a moment from the main purpose of the experiments, it is of interest to note that, after recovering from the initial disturbance involved in getting accustomed to the individual-feeding procedure, the individually-fed pigs did rather better than the group-fed pigs. Thus the average number of days required to grow from 49 lb. to 200 lb. live-weight in the three groups of the former test were 107.8, 112.0, and 114.3 days respectively, and for the corresponding lots in the group-feeding test 116.6, 116.5 and 122.8 days. A similar difference in meal consumption was also found in favour of the individual feeding, the average saving in meal per head in raising the live-weight from 43 lb. to 193 lb. being 40 lb., or 7 per cent. of the average food consumption of the group-fed pigs.

Other points of general interest that come out of the statistical examination of the growth and food consumption data are (1) a slight, yet "significant," difference in rate of growth in favour of gilts over hogs, (2) a slight advantage of gilts in efficiency of food conversion, (3) only a low degree of correlation between either weaning weights or the initial weights at the start of the experiments and the rates of live-weight increase recorded.

Turning next to the results of the examination of the carcasses, which was of a very detailed character, we find also that no evidence could be obtained of any appreciable alteration in the type or quality of the carcass that could be traced to the high protein feeding. In every criterion of quality studied, the differences between individual carcasses within any one feeding group were always much greater than the average differences between the groups.

Thus there was no significant effect on the thickness of back-fat and belly streak; or on the percentage of fat and lean in three typical rashers from the belly, back and gammon. The character of the feeding was also without significant influence

NOTES ON FEEDING

on (a) the size of the "eye" muscle, (b) the length of the pigs, (c) the carcass percentages, (d) the weight of the flares, (e) the weight of the fillet (psoas muscle) or the percentage of water in it, (f) the mean iodine values of the fillet fat, and (g) the mean weights of the sides and gammons.

There was some evidence that the high protein feeding may have caused a very slight softening of the back-fat, but the effect was too small to be of practical significance, and may in fact have been due to other causes.

In view of the theoretical possibilities of injury to the kidneys through excessive feeding of protein, it is of interest to note that with the pigs on the highest protein rations (Treatment C) there was a significant increase in the weight of the kidneys, which otherwise had a perfectly normal and healthy appearance. Since no such increase was found in the pigs on Treatment B, however, we may conclude that the risks of serious kidney disorder with the rations commonly used in pig-feeding is not serious.

Gilts produced somewhat leaner carcasses than hogs, graded rather better, and had a tendency to produce a slightly longer carcass and heavier fillet, although the differences in the two latter respects were hardly large enough to be conclusive.

In view of the controversy as to whether the thickness of the shoulder fat is a sufficiently accurate criterion of the general condition of fatness of the pig, it is of interest to note that the Cambridge data show a very strong correlation between the mean back-fat and shoulder-fat measurements, so that apparently these measurements were of about equal value as an index of thickness of fat along the back. The correlation between mean back-fat and the percentage of fat in the complete rasher was, however, only significant with the hogs, and not with the gilts, and, therefore, especially in view of the limited data available, it would not be safe to assume that either the thickness of the shoulder fat or the average of the maximum and minimum thickness of back-fat are entirely satisfactory criteria of the general fatness of the carcass.

In concluding this brief survey of the valuable Cambridge report, it may be desirable to repeat the note of caution with which it ends, that the findings of the investigation "are, strictly speaking, referable only to the particular strain of Large Whites forming the experimental animals in the present

NOTES ON FEEDING

trial, and possibly only to animals of this strain in so far as they subsist on rations made up from the foods used in the present feeding treatments."

Evidence that the broad general findings, as to the ineffectiveness of high protein supply in enhancing growth rate and carcass quality, are more widely applicable, is already available, however, in the records of the numerous feeding experiments dealing with the same subject that have been carried out during the past ten years at the Harper Adams College. These experiments have consistently failed to show any advantage, either in growth-rate or leanness of carcass, from increasing the concentration of protein in the rations beyond a level similar to, or even slightly lower than, that used in the "control" rations of the Cambridge investigations.

The recent co-operative tests along similar lines that have been carried out at the Scottish agricultural colleges, and of which mention was made in the opening paragraph of these notes, have also led to a similar conclusion.

There would thus appear to be quite adequate warrant now for the advice to the practical pig-feeder that there is no advantage to be gained by introducing more protein into his rations than corresponds to a level of about 17 per cent. total protein for the weaner, reduced gradually to about 12 per cent. for the 200-lb. baconer. A weaner ration that will comply roughly with this standard can be made from 5 parts ground cereals, 3 parts weatings, and 1 part protein concentrate (50 per cent. protein), and from this starting point the proportion of ground cereals may be gradually increased until, for the final stages, a mixture of 16 parts cereals, 3 parts weatings and 1 part protein concentrate is reached.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	6 15
Maize	78	7·6	5 13
Decorticated ground-nut cake	73	41·3	7 18
„ cotton-seed cake	68	34·7	7 17

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 1·68 shillings, and per unit protein equivalent 1·29 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 13
Oats	60	7·6	5 11
Barley	71	6·2	6 7
Potatoes	18	0·8	1 11
Swedes	7	0·7	0 13
Mangolds	7	0·4	0 12
Beans	66	19·7	6 16
Good meadow hay	37	4·6	3 8
Good oat straw	20	0·9	1 15
Good clover hay	38	7·0	3 13
Vetch and oat silage ..	13	1·6	1 4
Barley straw	23	0·7	2 0
Wheat straw	13	0·1	1 2
Bean straw	23	1·7	2 1

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British. . .	8 18	0 8	8 10	72	2 4	1·25	9·6
Barley, British feeding	7 0	0 8	6 12	71	1 10	0·98	6·2
„ Danubian . .	7 3	0 8	6 15	71	1 11	1·03	6·2
„ Persian . .	6 8*	0 8	6 0	71	1 8	0·89	6·2
Oats, English, white . .	7 0	0 9	6 11	60	2 2	1·16	7·6
„ „ black and							
„ „ grey . .	7 0	0 9	6 11	60	2 2	1·16	7·6
„ Scotch, white . .	8 7	0 9	7 18	60	2 8	1·43	7·6
„ Canadian, No. 2							
„ Western . .	8 13*	0 9	8 4	60	2 9	1·47	7·6
„ Canadian,							
„ mixed feed	6 15	0 9	6 6	60	2 1	1·12	7·6
Maize, Argentine . .	5 13	0 7	5 6	78	1 4	0·71	7·6
„ Danubian Gal. Fox	6 3†	0 7	5 16	78	1 6	0·80	7·6
„ South African,							
„ No. 2 White flat	7 2†	0 7	6 15	78	1 9	0·94	7·6
Beans, English, Winter	6 0§	0 16	5 4	66	1 7	0·85	19·7
Peas, English, blue . .	11 10§	0 14	10 16	69	3 2	1·70	18·1
„ Japanese . .	19 3†	0 14	18 9	69	5 4	2·86	18·1
Milling Offals:—							
„ Bran, British . .	6 15	0 15	6 0	43	2 9	1·47	9·9
„ broad . .	7 5	0 15	6 10	43	3 0	1·61	10
„ Middlings, fine,							
„ imported . .	7 2	0 12	6 10	69	1 11	1·03	12·1
„ Weatings† . .	7 5	0 14	6 11	56	2 4	1·25	10·7
„ „ Superfine†.	7 17	0 12	7 5	69	2 1	1·12	12·1
„ Pollards, imported . .	6 15	0 14	6 1	50	2 5	1·29	11
Meal, barley . .	8 10	0 8	8 2	71	2 3	1·20	6·2
„ „ grade II . .	7 15	0 8	7 7	71	2 1	1·12	6·2
„ „ maize . .	6 7	0 7	6 0	78	1 6	0·80	7·6
„ „ germ . .	6 7	0 11	5 16	84	1 5	0·76	10·3
„ „ locust bean . .	7 15	0 5	7 10	71	2 1	1·12	3·6
„ „ bean . .	8 5	0 16	7 9	66	2 3	1·20	19·7
„ „ fish, white . .	14 10	2 1	12 9	59	4 3	2·28	53
Maize, cooked, flaked . .	6 15	0 7	6 8	84	1 6	0·80	9·2
„ „ gluten feed . .	6 10	0 12	5 18	76	1 7	0·85	19·2
Linseed cake—							
„ English, 12% oil . .	9 2	1 0	8 2	74	2 2	1·16	24·6
„ „ 9% „ . .	8 12	1 0	7 12	74	2 1	1·12	24·6
„ „ 8% „ . .	8 7	1 0	7 7	74	2 0	1·07	24·6
„ „ 6% „ . .	8 12§	1 0	7 12	74	2 1	1·12	24·6
Cottonseed cake,							
„ English, Egyptian							
„ seed, 4½% oil . .	5 7	0 17	4 10	42	2 2	1·16	17·3
Cottonseed cake,							
„ Egyptian, 4½% oil . .	5 5	0 17	4 8	42	2 1	1·12	17·3
Cottonseed cake,							
„ decorticated, 7% oil	7 17†	1 7	6 10	68	1 11	1·03	34·7
Cottonseed, meal							
„ decorticated, 7% oil	7 15†	1 7	6 8	70	1 10	0·98	36·8

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Coco-nut cake, 6% oil. .	£ s. 6 15	£ s. 0 17	£ s. 5 18	77	s. d. 1 6	d. 0·80	% 16·4
Ground-nut cake, decorticated, 6-7% oil	7 17†	1 7	6 10	73	1 9	0·94	41·3
Ground-nut cake, imported decorti- cated, 6-7% oil ..	8 0	1 7	6 13	73	1 10	0·98	41·3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 12	6 3	73	1 8	0·89	16·9
Palm-kernel cake meal, 4½% oil ..	6 12†	0 12	6 0	73	1 8	0·89	16·9
Palm-kernel meal, 1-2% oil ..	6 2	0 12	5 10	71	1 7	0·85	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale ..	5 17	0 11	5 6	48	2 2	1·16	12·5
Brewers' grains, dried porter ..	5 10	0 11	4 19	48	2 1	1 12	12·5

* At Bristol.

§ At Hull.

† At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the beginning of November, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :—N., 7s. ; P₂O₅, 2s. 3d. ; K₂O, 3s. 6d.

MISCELLANEOUS NOTES

Importation of Narcissus Bulbs into the United States

THE Ministry has received from the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture a copy of a circular (B.E.P.Q. 412) dated September 16, 1936, and entitled "Information for Prospective Importers regarding the entry of Foreign Narcissus Bulbs on and after 15th December, 1936."

From that date, as has been previously announced, the existing embargo on the entry into the United States of certain varieties of Narcissus bulbs will be raised, and permits will be obtainable for the entry of all classes of Narcissus bulbs, which must, however, as in the past, be accompanied by official certificates of health issued in the country of origin.

It is now announced in the present circular, that in view of the difficulty of determining by external examination the freedom of Narcissus bulbs from infestation with the Bulb Eelworm (*Anguillulina dipsaci*), plant quarantine inspectors will require all imported Narcissus bulbs to be given "the latest approved treatment" as a condition of entry.

The term "latest approved treatment" will be construed as consisting of soaking the bulbs in water at a temperature of 70 to 80° F., preferably 75°, for a period of two hours, after which the bulbs are to be kept in hot water until all the bulbs have reached a temperature of 110 to 111° F., throughout. The bulbs are then to be kept in hot water at a temperature of not less than 110° F., for a period of four hours. As a precautionary measure to check the subsequent dissemination of diseases such as basal rot, a pint of formalin may be added for each 35 gal. of water, but the addition of the disinfectant is optional with the importer.

Treatment may be given at the port of first arrival or at any point designated in the permit, but the permittee will be required to have available at such place of treatment the services of a treating plant capable of treating the importation according to the method prescribed above. Applicants for permits to import Narcissus bulbs are asked to state, when submitting the application for permit, the point and premises at which they propose to have the bulbs treated.

All charges incident to such hot-water treatment are to be met by the importer or owner, but there will be no charges for the services of a plant quarantine inspector to supervise the treatment.

MISCELLANEOUS NOTES

The Agricultural Index Number

THE general index number of prices of agricultural produce for October is 125 (corresponding month of 1911-13=100), or 2 points lower than a month earlier, but 12 points above the figure recorded for October, 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number becomes 129.) The principal price increases were in respect of wheat, oats, fat pigs, eggs, butter, milk and potatoes, whereas average quotations for barley, fat cattle and cheese were lower on the month.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month.	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117
August	121	105	105	119	113	119
September	120	104	107	119	121	127
October	113	100	107	115	113	125
November	112	101	109	114	113	—
December	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January	—	111	119	124	125
February	—	110	117	122	123
March	—	106	112	119	122
April	—	109	116	126	129
May	—	105	116	117	120
June	—	104	114	117	121
July	—	104	117	120	121
August	108	108	122	120	124
September	108	111	125	128	133
October	104	112	121	120	129
November	105	113	120	119	—
December	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. The average price of wheat at 8s. 5d. per cwt. was 1s. 1d. higher than in September, and the index moves

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upwards from 98 to 113. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration the figure is 131.) Barley, at 10s. 1d. per cwt., showed a reduction of 3d., which, in conjunction with a reverse movement in the base price, results in the index falling by 5 points to 119. Oats, at 6s. 10d. per cwt., compared with 6s. 7d. in the previous month, and the index rises from 98 to 99. In October, 1935, wheat averaged 5s. 11d. per cwt., barley 9s. 4d., and oats 6s. 2d., the relative indices being 80, 110 and 89.

Live Stock. Fat cattle showed a further reduction in price during October, second quality averaging 31s. 8d. per live cwt. as against 32s. 10d. in September, and the index at 95 is lower by 3 points; the effect of adding the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, is to raise the index to 109. At an average of 9½d. per lb. for second quality, fat sheep were unaltered both in price and index (131). Quotations for baconers rose by 3d. to 11s. 8d. per score (20 lb.), and those for porkers by 1s. 1d. to 12s. 11d., the respective indices moving from 111 to 114 and 109 to 119.

Dairy cows were dearer than in September, and the index at 107 is higher by 4 points. On the other hand, store cattle were slightly cheaper, the index declining from 97 to 95. Store sheep and pigs made rather more money; the index for the former remains unchanged at 132, while that for the latter is 12 points above the September figure of 138.

Dairy and Poultry Produce. The regional contract price of milk rose on the month by 2d. per gal., but in consequence of a larger increase during the base period, the latest index at 171 is lower by 31 points. Butter, at 1s. 1¾d. per lb., compared with 1s. 1¼d. per lb. in September, and, as the same increase was recorded during the corresponding months of 1911-13, the index at 98 is unaltered. Average quotations for eggs at 19s. 7d. per 120 were higher by 4s. 10d., the index rising from 124 to 141. Cheese was slightly reduced in price, although the fall of 5 points in the index is due principally to the upward movement in the base prices. Average quotations and indices for poultry were rather variable during the month under review, but geese were considerably firmer in price; the combined index rises from 113 to 115.

Other Commodities. Potatoes at £7 5s. 6d. per ton rose by £1 15s. per ton, and the index moves upwards by 53 points to 202. Last month's prices of clover and meadow hay were about maintained, but, owing to a rise having

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occurred between September and October in the base years, the combined index of 102 shows a fall of 3 points. At 1s. 1½d. per lb., wool was ¼d. more than in September, and the index is increased by 2 points to 102.

Monthly Index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity.	1934	1935		1936		
	Oct.	Oct.	July	Aug.	Sept.	Oct.
Wheat	67	80	86	96	98	113
Barley	111	110	84	100	124	119
Oats	94	89	83	98	98	99
Fat cattle	97	92	100	102	98	95
„ sheep	128	121	128	128	131	131
Bacon pigs	99	90	113	111	111	114
Pork „	112	99	106	107	109	119
Eggs	115	118	123	130	124	141
Poultry	116	117	117	113	113*	115
Milk	161	171	175	175	202	171
Butter	84	95	100	100	98	98
Cheese	93	82	113	113	106	101
Potatoes	151	152	139	109	149	202
Hay	101	91	82	98	105	102
Wool	85	89	94	95	100	102
Dairy cows	107	107	104	103	103	107
Store cattle	85	90	101	101	97	95
„ sheep	111	120	113	126	132	132
„ pigs	143	124	126	133	138	150

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	117	122*	112	122	130	131
Fat cattle	112	107	114	117	113	109
General Index	121	120	121	124	133	129

* Superseding figure previously published.

Foot-and-Mouth Disease.—As no further outbreak of Foot-and-Mouth Disease occurred in the Oxfordshire Infected Area after October 18 the area was freed from restrictions on November 9.

Three further outbreaks were confirmed in the Flintshire and Cheshire Infected Area, two at Little Saughall, Chester, on October 23 and October 29 respectively, and one at Huntington, Chester, on October 30. There have been nine outbreaks in this area since the initial outbreak was confirmed at Sealand on October 15. The disease position was satisfactory on November 4, and, therefore, the area under restrictions was reduced on that date to a zone extending approximately five miles round the infected premises at Sealand and Churton Heath. Restrictions were finally removed from this area on November 21.

Outbreaks were confirmed at Lymington, Hampshire, on October 27; at Ludgvan, Cornwall, on October 29; and at South Elmham, St. Michaels, Halesworth, Suffolk, on November 2. The usual restrictions were imposed over areas of approximately 15 miles radius round each of the infected

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premises. Further outbreaks were confirmed at Brockenhurst, in the Hampshire Infected Area, on October 29 and at Halesworth, in the Suffolk Infected Area, on November 8. Orders were issued contracting the Hampshire Area on November 11, the Cornwall Area on November 13 and the Suffolk Area on November 17, in each case to approximately five miles round the infected premises. Both the Hants and the Cornwall areas were freed from restrictions on November 20, and the Suffolk area was released from restrictions on November 30.

A fresh outbreak was confirmed at Idless, Truro, Cornwall, on November 21, and the usual restrictions were imposed over an area of approximately 15 miles round the infected premises. As emergency restrictions had been in operation since November 18, and the position was satisfactory, arrangements were made to contract the area to approximately 5 miles on December 3. Two outbreaks were confirmed at Bosley, Macclesfield, Cheshire, on November 23 and 26 respectively, and at Foolow, Eyam, Derbyshire, on November 27. The usual restrictions have been imposed over an area of approximately 15 miles round the infected premises.

Farm Workers' Minimum Rates of Wages.—Meetings of the Agricultural Wages Board were held at King's Buildings, Smith Square, London, S.W.1., on October 27, and November 17, 1936, Mr. W. B. Yates, C.B.E., D.L., J.P., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders:—

Bedfordshire and Huntingdonshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into operation on November 1, 1936, and continue in force until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall, when the hours are 41; and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall, when the hours are 31, with overtime throughout the period at 9½d. per hour on weekdays, 10½d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day and 11½d. per hour on Sundays (instead of 9½d., 10½d. and 11½d. respectively as at present). The minimum rates for female workers of 18 years of age and over remain unchanged at 6½d. per hour with overtime at 7½d. per hour on weekdays, 8½d. on Easter Monday, Whit Monday, Christmas Day and Boxing Day and 9½d. per hour on Sundays.

Cheshire.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 31, 1937. The minimum rates for male workers of 21 years of age and over are 34s. (instead of 32s. 6d. as at present) per week of 54 hours, with overtime at 9d. per hour (instead of 8½d. as at present). For female workers of 18 years of age and over the minimum rate is unchanged at 6d. per hour for all time worked, provided that, in the case of female workers engaged for milking, such workers shall receive not less than 6d. per "meal" (i.e., each occasion on which the worker visits her place of employment for the purpose of milking).

Northamptonshire and Soke of Peterboro'.—An Order fixing minimum and overtime rates of wages to come into force on November 1, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 30, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (instead of 31s. 6d. as at present) per week of 48 hours in winter, except in the week

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in which Christmas Day falls, when the hours are 39½, and 50 hours in summer, except in the weeks in which Easter Monday and Whit Monday fall, when the hours are 41, with overtime at 10d. per hour (instead of 9d. per hour as at present) on weekdays, and 1s. per hour (instead of 11d. per hour as at present) on Sundays, Christmas Day, Easter Monday and Whit Monday. The minimum rates for female workers of 18 years of age and over remain unchanged at 6½d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Christmas Day, Easter Monday and Whit Monday.

Shropshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on November 1, 1936, and to continue in operation until May 31, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours, except in the weeks in which Christmas Day and Good Friday fall, when the hours are 44½ (instead of 54 hours throughout the whole period as at present), with overtime unchanged at 9d. per hour on weekdays and for attention to stock on Sundays, and 10d. per hour for other employment on Sundays. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour with overtime at 6d. per hour.

Staffordshire.—An Order varying the existing minimum and overtime rates of wages as from November 22, 1936. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours, except in the weeks in which Christmas Day and Good Friday fall, when the hours are 44½ (instead of 54 hours throughout the year as at present) with overtime unchanged at 9d. per hour. The minimum rates for female workers of 18 years of age and over remain unchanged at 5d. per hour, with overtime at 6d. per hour.

East Riding of Yorkshire.—(1) An Order fixing minimum and overtime rates of wages to come into force on November 24, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 23, 1937. The minimum rate for male workers of 21 years of age and over is 34s. 6d. (instead of 33s. 6d. as at present) per week of 52½ hours in summer, except in the weeks in which Good Friday and Coronation Day fall, when the hours are 43, and 48 hours in winter except in the week in which Christmas Day falls, when the hours are 39½, with, in addition in the case of workers living in, not more than 12 hours per week on weekdays and 3 hours on Sunday spent on the care of and attention to stock. The overtime rates for male workers of 21 years of age and over are 10d. per hour on weekdays and 1s. per hour on Sundays, Good Friday, Coronation Day and Christmas Day. The minimum rates for female workers of 16 years of age and over remain unchanged at 6d. per hour with overtime at 9d. per hour.

(2) An Order fixing minimum differential rates of wages for overtime employment on the Corn Harvest of 1937, the rate for male workers of 21 years of age and over being 1s. 3d. per hour and for female workers of 16 years of age and over 11d. per hour (as in 1936).

North Riding of Yorkshire.—An Order fixing minimum and overtime rates of wages to come into force on November 24, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 23, 1937. The minimum rate for male workers of 21 years of age and over (other than casual workers) is 34s. (instead of 33s. as at present) per week of 50 hours in winter, except in the week in which Christmas Day falls, when the hours are 41, and 52½ hours in summer, with payment for employment in connexion with the care of and attendance upon animals where the total

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hours exceed the number mentioned above, unchanged at 3*d.* per hour for those workers who are boarded and lodged by their employer, and 6*d.* per hour for those who are not so boarded and lodged. The overtime rates are unchanged at 9*d.* per hour on weekdays and 11*d.* per hour on Sundays and on Christmas Day. For male casual workers of 18 years of age and over the minimum rate remains unchanged at 7*d.* per hour for all time worked. For female workers of 18 years of age and over the minimum rate is 6*d.* per hour, provision being made in the case of whole time workers for payment at not less than 22*s.* per week of 36 hours in the week in which Christmas Day falls and 44 hours in any other week, with overtime at 9*d.* per hour.

Carmarthenshire.—An Order fixing minimum and overtime rates of wages to come into force on November 15, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until November 14, 1937. The minimum rates for male workers of 21 years of age and over are 32*s.* (instead of 31*s.* 6*d.* as at present) per week of 54 hours with overtime unchanged at 8½*d.* per hour. For female workers of 18 years of age and over the rates are 5*d.* per hour with overtime at 6*d.* per hour as at present.

Glamorganshire.—An Order fixing minimum and overtime rates of wages for male workers wholly or mainly employed in forestry to come into force on November 1, 1936, and to continue in operation until November 1, 1937. The minimum rates for male workers of 21 years of age and over are 39*s.* per week of 48 hours in winter and 52 hours in summer, with overtime at 11*d.* per hour.

Enforcement of Minimum Rates of Wages.—During the month ending November 13, 1936, legal proceedings were taken against fifteen employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Cheshire ..	Macclesfield	6 0 0	4 4 0	51 11 4	4
Derby ..	Chesterfield	30 0 0	(a)	30 4 5	2
" ..	"	7 10 0	(a)	20 0 0	1
" ..	Ashbourne	(b)	2 17 6	30 0 0	1
Lancs ..	Rochdale ..	(c)	0 9 6	13 0 0	1
" ..	Royton ..	1 0 0	2 3 6	13 17 7	1
Lincs (Kest-even and Lindsey) ..	Grantham ..	10 0 0	3 16 0	110 0 0	5
Suffolk ..	Halesworth ..	5 0 0	0 8 0	37 8 9	4
Sussex ..	Mark Cross	1 0 0	2 4 0	7 11 9	1
Yorks, W.R.	Halifax ..	2 0 0	0 6 0	50 0 0	1
" ..	Wetherby ..	2 0 0	—	12 0 0	1
Brecon ..	Builth Wells	1 0 0	1 12 6	21 10 9	1
" ..	Crickhowell	1 0 0	—	36 10 0	1
Carmarthen ..	Llangadock	(d)	—	—	1
Glamorgan ..	Bridgend ..	4 0 0	2 12 0	13 12 8	2
		70 10 0	20 13 0	447 7 3	27

(a) Cost included in the fine. (b) Dismissed under the Probation of Offenders Act. (c) Conviction recorded. (d) Case dismissed.

WIRELESS TALKS TO FARMERS DECEMBER, 1936

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
NATIONAL : December 7	6.20	Messrs. Anthony Hurd and Rees Owen	Smithfield Show. The Welsh Stockbreeder's Problem.
MIDLAND : December 6	5.45	Mr. Graham Castle	Our Country Correspondent : Gloucestershire.
" 10	6.40	Mr. W. B. Thompson	For Midland Farmers.
WELSH : December 11	7.30	Messrs. Moses Griffith and R. G. Gardner	Welsh Farming : Cattle Feeding : An Anglesey experiment. The buying and selling of store cattle. The history of the greatest Show in Britain, the Exhibition at Smithfield, London. Changes in the types of stock exhibited, difference in ages and reasons for this. Characteristics of various breeds ; adaptation to environment.
NORTH : December 4	6.40	Mr. C. E. Hudson	Gardening for Profit : Tomatoes.
" 11	6.40	Mr. A. McVicar	Gardening for Profit : Mushrooms.
" 16	6.40	Mr. W. B. Mercer	For Northern Farmers in Particular : Sheep in General.
SCOTTISH : December 2	6.40	Mr. A. D. Buchanan Smith	The Scottish Fat-Stock Show.
" 9	6.30	Mr. R. L. Scarlett	For Scottish Farmers.
" 17	6.40	Not yet fixed	Probably Rural Housing.
WEST : December 3	6.40	Mr. A. W. Ling and a poultry farmer	For Western Farmers in Particular : A discussion on poultry.
" 11	8.15	Mr. A. W. Ling	Christmas Markets : A conducted tour of Newton Abbot Fat Stock Show.
" 17	6.40	Mr. A. W. Ling	For Western Farmers in Particular.
" 7	9.10	Mr. D. Harris	For Western Gardeners.

Gardening talks this month will be given again under the editorship of C. H. Middleton, who, on December 6, will discuss trees with Mr. Le Sueur; and, on the 13, talk about seasonal topics. On December 20, Mr. Middleton is bringing some well-known people to the microphone to talk about how the Coronation affects horticulture. Among the speakers will be Colonel Durham, Secretary of the Royal Horticultural Society ; Mr. George Monro, of Covent Garden Market ; Mr. T. Hay, of Hyde Park, and a well-known West End florist. In the last talk this year Mr. Middleton will review the year's work and look forward to the future.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Cheshire: Miss G. M. Ashforth, N.D.P., has been appointed Student Demonstrator in Poultry-keeping, *vice* Miss U. M. Heler, N.D.P.

Cumberland and Westmorland: Miss A. R. Pinkerton, N.D.P., has been appointed Assistant Poultry Instructor, *vice* Miss K. Thompson, N.D.P.

Essex: Mr. R. Robertshaw, N.D.A., N.D.D., has been appointed Assistant Lecturer in Agriculture.

Mr. F. C. Creyke, N.D.A., N.D.D., has been appointed Assistant Dairying Instructor, *vice* Mr. R. Robertshaw, N.D.A., N.D.D.

Amendment of notification in the November, 1936, issue of this Journal.

NOTICES OF BOOKS

The Genetics of the Pig. By A. D. Buchanan Smith, O. J. Robison and D. M. Bryant. Reprint from *Bibliographia Genetica*, XII, pp. 1-160. (Edinburgh: Institute of Animal Genetics, West Mains Road. 1936. Price 3s. 6d.)

This work constitutes the most complete study that has yet been made of the available data on the genetic characters of the pig. It begins with a section on chromosome numbers. It is shown that there are probably two types of chromosome complement with diploid numbers of 38 and 40. The possible explanation of the two types is that the domestic pig is a cross between *Sus scrofa* and *S. vittatus*, which are represented in varying proportions, most breeds being descended mainly from *S. vittatus*, while the pork or lard breeds, such as the Berkshire and Middle White, are chiefly based on *S. scrofa*. Here it may be remarked that comparable views, supported in each case by a considerable amount of evidence, have been put forward by Cossar Ewart and others as to the multiple origin of horses, cattle and sheep.

The section on colour inheritance is informative and useful, and the results obtained by different investigators are carefully analyzed. It is interesting to find that whereas "white" appears to be genetically the same for all breeds, there are several kinds of "black" and at least two genotypes for "red." In the chapter on hair and skin one would have liked more precise information as to the number and distribution of the sweat glands, since this point is of great interest in connexion with the physiology of heat regulation, but, as the author points out, the number of investigations on the physiology of the pig is very limited.

There are a few notes on the blood groups, the thermal metabolism and the thyroid gland, and these are followed by a section on the highly important subject of disease resistance, which is dealt with as fully as the data permit, and the results of different investigators are carefully criticized. A certain degree of resistance seems to be inherited, and this is the best that can be said at present. After a short and unimportant section on mental traits the genetics of sex and generation is dealt with at considerable length, and everything of importance seems to be included. The evidence as to the inheritance of fertility is well set out, as well as that relating to mothering ability and milking capacity. As indicating the scope and completeness of the memoir it may be mentioned that Baker's studies on the inter-sexuality of the New Hebridean pigs are duly referred to and discussed.

It is surprising that so little work has been done on the genetics of the anatomical characters, for the authors are able to dismiss this subject in less than six pages. In the much longer section on abnormalities and defects, investigations on twenty or more abnormal conditions are referred

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to and the evidence as to their inheritance is considered. One of the defects dealt with is "seedy-cut" or "black-belly," and the correlation between the pigment in the skin and that in the mammary glands is pointed out. It might have been added that in Tamworth pigs the pigment in the glands (really in the walls of the ducts of the glands) is sandy, corresponding to the red pigment in the hair, and that spaying, by inhibiting the development of the mammary glands, prevents the formation of the pigment in the ducts. The other defective conditions (syndactyly, polydactyly, bent-leg, hernia, cryptorchism, cleft palate, etc.) are dealt with as fully as the data permit, and as a summary of what is known on these matters the memoir should be of much value.

The book, however, is something more than a work on genetics, for it includes sections that deal with production and possible methods of improvement. In including these the authors have done wisely, for unless the productive qualities of the pig are analysed no ultimate synthesis is possible, and as Buchanan Smith and his colleagues have shown, there already exists knowledge that can be usefully employed for the improvement of the hereditary qualities. The memoir is provided with a very full bibliography and a good index.

The Land of Britain. The Report of the Land Utilization Survey of Britain. Edited by L. Dudley Stamp, B.A., D.Sc. Part 78.—Berkshire. By J. Stephenson, B.A., with an historical section by W. G. East, M.A. Pp. 111. Maps. (London: The Land Utilization Survey of Great Britain, London School of Economics, Houghton Street, London, W.C.2. 1936. Price 2s. 6d.)

The work of the Land Utilization Survey must already be widely known in rural circles, where it has been in progress for some years past. As readers of this JOURNAL will be aware, it is carried out under the aegis of the London School of Economics, and has been done with the co-operation of a large number of societies and educational authorities. The work is now drawing to a conclusion, and the publication of Part 78, dealing with the county of Berkshire, is the first harvest resulting from a great deal of spade-work.

If this report is a sample of what we are to expect as a result of the work, those who have looked forward to the publication of the results will not be disappointed. Considerable attention has been paid to the geographical background of the farming of Berkshire, and, although some critics may consider that John Orr's book on Berkshire, published some twenty years ago, would give them a more immediately comprehensible picture of the farming of the county, this work cannot be neglected. It has its basis in geographical foundations rather than in the sociological organization of the district. It shows the reason why particular kinds of farming are employed, rather than stating baldly the fact that particular systems are employed in particular districts.

Perhaps not the least valuable part of the volume is the survey, by W. G. East, of *Land Utilization in Berkshire about 1800*, which is based upon the reports of the old Board of Agriculture made at that time. Although this survey is very synoptic, it does afford a basis for comparison with the modern conditions, which cannot but be valuable.

A disadvantage that can be envisaged in connexion with the Land Utilization Survey is that it has occupied a long time, and it would appear that the publication of the particulars dealing with the separate counties will also occupy a long period. Moreover, if the present volume is a good sample, they will be rather technical. It might be an advantage if a rapid survey, carried out simultaneously by local authorities, and not too technical in statement, could be undertaken.

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Plant Breeding Abstracts: Supplement II. Pp. 63. (Cambridge: School of Agriculture. 1936. Price 5s.)

This supplement summarizes over 400 annual reports received at the Imperial Bureau of Plant Genetics, Cambridge, from stations in the British Empire during the year 1932-35. The range covered is vast, the crops dealt with including practically all economic plants with the exception of herbage plants. The work reported contains sections on breeding, cytology and the genetics of plant parasites. The supplement is planned so as to facilitate ready reference to the account of any given crop in any given country, and an extensive index is also provided.

Pedology. By Jacob S. Joffe. Pp. xvi + 575, illustrated. (Rutgers University Press, New Jersey. Price \$5.50.)

In the preliminary announcement of this work, it was described as "an authoritative treatise on soils from a pedologist—the first to appear in the English language." Ten incisive paragraphs proclaimed Pedology, now authoritatively expounded for the first time, to be the key to the problems of the agronomist, the forester, and the pomologist.

Thus heralded, it was not surprising that the appearance of Dr. Joffe's book was eagerly awaited by students of the soil. *Pedology* is now available and the reviewer may set himself to decide: (1) to what extent are the claims made for it justified? and (2) what is the value of the book to students of the soil?

On the first question, the reviewer does not feel that the work justifies the claims made for it beforehand. Insufficient attention is devoted to the exposition of the constitution and properties of soils, and practically no mention is made of the important subject of soil physics, including the moisture relationships of soils. Without an understanding of these matters, soil systematics cannot be placed on a secure foundation.

Exception may also be taken to the undue attention given to Russian work in a comprehensive account of the subject. Approximately one-half of the references are to Russian publications. This might be justified if it were admitted that pedology is mainly Russian. Even so, the newer Russian ideas, at variance with those of the classical school of Docuchaiev and Glinka, are not given attention.

As to the value of the work to the soil student, however, there can be no doubt. It is definitely written from the Russian standpoint, and is undoubtedly an able and much-needed exposition of the ideas of the Russian school. Dr. Joffe has rendered a great service by making available to English readers a large body of work which has hitherto been either inaccessible or accessible only in the form of abstracts. The more recent Russian work, which was probably published too late to be dealt with in the present book, will doubtless receive attention in the next edition, which will certainly be required.

The introductory chapters on the constitution and genesis of soils, although useful and suggestive, are, as mentioned above, inadequate for a treatise on the subject as a whole. The greater part of the book, some 400 pages, is devoted to soil systematics. Although, on account of the scarcity of material, some groups are insufficiently treated, this section as a whole provides a rich store of information, much of which is new to English readers. The chapters on the chernosems, podzols, and intrazonal soils are particularly valuable.

The book is well produced and adequately illustrated. It contains over 950 bibliographical references. Although it does not completely justify the great claims made in its announcement, it is, nevertheless, a valuable and important contribution to the literature of the subject.

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NOTES FOR THE MONTH

The Argentine Agreement and Agriculture in the United Kingdom

AS Argentina supplies nearly two-thirds of our total beef imports, the new Agreement recently signed, to replace the "Roca" Agreement of 1933, is of special interest to the United Kingdom live stock industry. In general it provides for less favourable treatment of live stock products imported into this country from Argentina, and, in its provisions for the imposition of duties on beef and veal, and for the co-operation of the Argentine Government in proposals for the regulation of imports of beef through an International Conference, is in line with the live stock policy of the United Kingdom Government.

The 1933 Agreement guaranteed to Argentina free entry for all meats (except canned meats and meat extracts, on which the 10 per cent. duty was consolidated), but it provided for quantitative regulation of imports of frozen beef, mutton and lamb according to the programme set out in the Ottawa Agreements of 1932. This programme was fully carried out. Imports of foreign frozen beef, mutton and lamb were progressively reduced to 65 per cent. of Ottawa Standard Year quantities. Moreover, pork imports, not mentioned in the Agreement, were reduced by some 33½ per cent. Imports of chilled beef were limited in the 1933 Agreement to the Ottawa year quantity, with provision for a 10 per cent. reduction in certain circumstances. This conditional reduction was in fact imposed.

The chief innovation of the new Agreement is the provision for duties of ¾d. a lb. on chilled beef and ¾d. a lb. on frozen beef, and for corresponding duties (mainly 20 per cent. *ad valorem*) on other classes of beef imports. Should the incidence of the specific duty on chilled beef fall below a 20 per cent. *ad valorem* equivalent, the Agreement provides for corresponding modifications of the *ad valorem* duties in

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stages of $2\frac{1}{2}$ per cent. for six months at a time. Imports of mutton and lamb and pork are accorded entry free of duty into the United Kingdom, but they are to be subject to quantitative regulation.

The provisions in the Agreement for the quantitative regulation of imports of meat from Argentina are of considerable importance. For each of the various kinds of beef, Argentina receives a guarantee of both a minimum quantity and a minimum annual proportion of total regulated imports into the United Kingdom from foreign countries.

The minimum *proportion guarantees* are based on Argentina's share of the total foreign imports of the several classes of meat in some recent period. They have no significance other than as a safeguard to Argentina against unduly favourable treatment being afforded to other foreign countries.

The *quantities* which have been guaranteed as minima are in no instance higher and in some instances lower than recent levels. As regards chilled beef, which is by far the most important category, the 10 per cent. reduction on the Ottawa year level, to which a number of conditions were applied in the 1933 Agreement, is now confirmed unconditionally by the adoption of 1935 imports as the basic allocation; and this figure can be reduced by a quantity equivalent to 2 per cent. in any of the next three years, subject to a maximum reduction of 5 per cent. in the third year. For example, the Argentine allocation can be reduced by 2 per cent. of the 1935 quantity in 1937, a further 2 per cent. in 1938, and 1 per cent. (making 5 per cent. in all) in 1939.

As regards frozen beef, imports from Argentina have already been reduced by more than one-third since the Ottawa year, and that position is stabilized by the minimum quantitative guarantee. The guarantee for beef offals bears a percentage relationship to the combined allocations for chilled and frozen beef. The quantitative guarantee for canned beef, like that for frozen beef, will roughly stabilize the present level of foreign imports.

As with frozen beef, imports of mutton and lamb from Argentina to this country have been reduced since Ottawa by a full third. Argentina now supplies only about one-seventh of our total imports of these commodities. Imports of mutton and lamb from Argentina are stabilized (for 1937)

NOTES FOR THE MONTH

at approximately the present level of 65 per cent. of the Ottawa year quantity. They may be reduced by 10 per cent. in 1938 and no commitment has been entered into as regards minimum quantities for 1939. Pork imports from Argentina, which have been reduced by about one-third since 1934, will remain at present levels. They represent less than 20 per cent. of total imports of pork and an almost negligible proportion of total supplies on the United Kingdom market.

The Argentine Government agrees in principle to co-operate in the scheme at present in preparation for the regulation of supplies of beef to this market through an International Conference.

As regards other agricultural products, the Agreement consolidates existing duties on wheat in grain and linseed in grain, and guarantees the continued duty-free entry of maize in grain, except flat white maize. Wheat, maize, linseed and wheat offals continue free from quantitative regulation.

The Agreement remains in force until the end of 1939, when it may be terminated at any time subject to six months' notice being given.

On December 15, 1936, the Ways and Means Committee of the House of Commons passed two resolutions imposing on the main categories of foreign beef and veal the maximum duties permissible under the terms of the Agreement. These resolutions became effective from December 16, 1936.

Sooty Blotch of Apples and Plums

THE following note has been communicated by Dr. H. Wormald of the East Malling Research Station, East Malling, Kent:—

As a result of the cold, damp summer, the disease known as Sooty Blotch, caused by the fungus *Gloeodes pomigena*, has been very prevalent this year, and many inquiries concerning it have been received at East Malling. Even some of the fruit exhibited at shows has borne this blemish. During years when the rainfall and sunshine are round about the average there is, as a rule, not enough Sooty Blotch for the grower to give it any special attention, and in hot, dry seasons it is almost or quite unnoticed. For this reason no special precautions are taken by British fruit-growers to prevent it, although the ordinary routine treatment against Apple Scab probably tends to keep the disease in check during a normal season, especially when a late spray or dust is applied.

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Sooty Blotch would appear to be more important in America than in this country, and it has been investigated by a number of workers in the United States, where routine spraying with Bordeaux mixture or lime-sulphur, as used against Scab, is said to be effective against Sooty Blotch also.

The more immediate need of the British grower this year is to know how to treat the gathered crop when it is seriously disfigured by the blotch. The treatment recommended in America is a bleaching method, using the so-called Javelle water which is prepared by heating together, in water, bicarbonate of soda and chloride of lime. A simpler method, using chloride of lime alone, has been evolved by an experimenter in South Africa. Both methods have been tried at East Malling and both have been found to cause a considerable improvement in the appearance of the treated fruit. As there is little to choose between the two treatments with regard to the final result, the simpler method is given here.

Chloride of lime (bleaching powder) is added to water at the rate of $\frac{1}{2}$ lb. to the gallon. The mixture is well stirred and then allowed to settle. It may, if found to be a convenience, be left overnight to settle, for use the next day. The clear liquid is decanted or siphoned off and the sediment discarded. The fruit is immersed in this liquid for one minute. This bleaches the fungus on the blotches and the apples are then washed in clean water and allowed to dry. The method has been tried at East Malling, but only on a small scale, and the most convenient way of dealing with large quantities of fruit has not been determined. A method suggested is to load the fruit into shallow trays, in which it can be immersed in the liquid, taken out, exposed to the air, washed, and allowed to dry before it is removed from the tray.

The fungus penetrates only a little distance into the skin of the fruit and much of the blotch can be removed by wiping the fruit with a damp cloth; this involves the handling of each individual fruit, but it may be found practicable unless large quantities of fruit are to be treated.

Sooty Blotch occurs also on plums, some varieties of which may be so severely blotched as to be most unsightly. This is especially true of green- and yellow-skinned plums such as Warwickshire Drooper and Pershore Egg. Red and purple plums, however, may become infected also, although the blotching is less conspicuous than on the fruit with paler

NOTES FOR THE MONTH

skins. The bleaching treatment recommended above has been used at East Malling on plums and found to be successful.

Malting Barley

THE third annual Conference on malting barley held at Rothamsted on December 2, 1936, was a decided success. Farmers had sent in a record number of barley samples, there was a good and representative attendance, and the quality of many of the contributions was very high. Sir Merrik Burrell, Bart., C.B.E., was in the Chair. The primary purpose of the gathering was to enable growers to discuss with expert buyers the reasons underlying the grading of the samples displayed. The barleys, all of which were of malting quality, were graded as follows:—

Grade	A	B	C	D	E	F
No of samples ..	7	8	21	54	129	57
Per cent . . .	2.5	3	7.5	19.5	47	20.5

The proceedings opened with a valuable paper from Mr. H. M. Lancaster, one of the Committee of the Institute of Brewing, who had graded the barleys. It is common knowledge that barleys varying only slightly in external appearance bring very different prices in the market. Some few of them of specially attractive appearance meet such a keen demand in certain quarters that very high prices are obtainable. Whether these fancy barleys are absolutely necessary for the purposes for which they are intended, and whether they produce malts really superior to those from barley of slightly less attractive appearance, Mr. Lancaster was not prepared to say, for there is not at present a scientific standard for the valuation of barley. These specially fine barleys fall into grades A and B of the classification adopted. Following these came a set of sound, well-shaped samples representing the great bulk of barleys bought by brewers; they fall into Grades C, D, and E, their actual position being fixed by small refinements of appearance considered to be important to purchasers. In contrast to those who judge on external characteristics, others, working within the limits of sound, sweet grain, buy on nitrogen percentage, on the basis that grain low in nitrogen is high in carbohydrate and generally yields a sound, "tender" malt. Mr. Lancaster showed that the figures derived from the analyses of the samples shown at the previous Conference confirmed this relationship between grade and nitrogen in

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a general way. There were, however, individual exceptions that needed further examination.

In discussing the results of the grading, the contrast between the grain of 1935 and 1936 was most striking. The year 1935 produced bleached samples containing less than 15 per cent. of moisture, and few of them were really mellow; well-filled grain with thin skin was exceptional. In 1936 it was easy to find plump grain, but the moisture content was high and the "condition" was such that there has been a risk of faulty germination after kiln drying. All were more or less weathered. In spite of this there were on view plenty of samples that with proper treatment would make very good malt. Whether it was necessary to mix such malts with foreign "sun-kissed" barleys in order to keep up the quality of our beers was a question for experimental examination. In their capacity as producers of a high-grade article, however, brewers could not be expected to face the risks involved in trials of this kind.

Members of the Rothamsted staff briefly indicated the general conditions under which the barleys were grown, and pointed out certain apparent relationships between treatment and quality. (1) Autumn sowing or fairly early spring sowing, (2) a soil not too rich in organic residues, and (3) a standing crop, were some of the circumstances that were probably associated with quality above the average.

After inspection of the samples, a general discussion took place. In reply to certain farmers who were concerned about the presence of abnormal ears in their fields of Spratt Archer, Dr. H. Hunter informed the meeting that re-selection of Spratt Archer was now in progress at Cambridge and fresh stocks would be available when they had been thoroughly tested. Farmers should bear in mind that neither Plumage Archer nor Spratt Archer was intended for winter barleys, and those who sowed these varieties in the autumn should do so with their eyes open. Mr. S. F. Armstrong urged growers to demand re-selected seed, as machinery for the supply of this was in existence.

Other interesting points discussed were the artificial drying of barley on the farm; and the possibility of central valuation of barley samples on behalf of growers, so that, armed with knowledge of the quality of their grain, sellers would have a better basis on which to do business.

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Work of the Land Division of the Ministry, 1935

THE recently published Report on the Work of the Land Division of the Ministry for the year 1935 deals with the provision of small holdings and allotments by local authorities under the Small Holdings and Allotments Acts; the administration and finance of the Ministry's farm settlements; the sanction of schemes submitted by landowners in regard to loans under the Improvement of Land Acts; the extinguishment of fines and other manorial incidents attaching to land formerly of copyhold tenure; the control and management of commons; sales and other transactions under the Universities and College Estates Act and the Glebe Lands Act; the appointment of arbitrators in connexion with matters of dispute between landlord and tenant affecting agricultural holdings; and the redemption and apportionment of, and other transactions relating to, tithe rentcharge.

Special reference is made in the Report to the activities of the Commissioner for the Special Areas in undertaking, in co-operation with the Land Settlement Association, the Welsh Land Settlement Society and certain local authorities, the settlement of unemployed men on the land.

Apple Consumption in Relation to Population

IN the course of an address to the British Empire League on November 17, Mr. H. V. Taylor, Horticulture Commissioner to the Ministry, said that imports of apples into the United Kingdom increased from 3,028,000 cwt. in 1904 to 7,272,000 cwt. in 1935. This increase was connected with a rise in the population and in the general standard of living.

Until recently British growers failed to apply commercial standards to orcharding and marketing, with the result that the public preferred the imported fruit and acquired a taste for apples of low acidity and mild flavour, grown abroad, in preference to the more acid and high-flavoured types formerly favoured in this country. One result of this was that dessert apples of low acidity were now being planted in British orchards. In 1931 (the last year in which apples were admitted free of import duty) 58.5 per cent. of the imported apples were of foreign origin. The effect of the duty on foreign imports was to reduce this percentage, by increasing the duty-free Empire imports to 76 per cent. of the total in 1934. It is noteworthy, however, that the total imports remained approximately the same in 1935 as in 1931.

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Statisticians were predicting a decline in the home population, and this must inevitably involve a decline in the demand for apples if the present rate of consumption could not be increased. Medical opinion favoured the inclusion of more fruit in the diet, and, partly in response to propaganda, the per capita consumption rate of apples increased from 23 lb. in 1924 to 32.5 lb. in 1934. An even greater rate of increase would be necessary to counteract the effects of a possible fall in the population.

The home industry was being stimulated by the establishment of fruit research stations. A Cider Research Station established at Long Ashton in 1901 was enlarged in 1913 to become a Fruit Research Station, and in the following year a second Station was founded at East Malling. In 1928 National grades were defined by legislative action, and a National Mark scheme for apples was inaugurated. The scheme is voluntary, but already the apples sold under its provisions form a large volume.

In 1874 the area of orchards of all kinds in Great Britain was 148,221 acres. In 1931 the area in England and Wales amounted to 244,778 acres, and this had expanded by 1935 to 262,115 acres, an increase of over 17,000 acres in four years. Research had disproved the opinion, formerly widely entertained, that the home climate was less favourable for apple production than that of the United States and certain Empire countries. It had been demonstrated that the climate was less at fault than the methods adopted, and that by spraying and manuring good crops could be produced. New planting of popular varieties had been made, and packing stations equipped with grading machinery were now common in most fruit districts.

The effects of these methods were evident in the increased consumption of home-grown apples. In 1924 only 25 per cent. of the apples consumed in the United Kingdom were grown there, while 27 per cent. were supplied from Empire countries and 38 from the United States of America. Ten years later 57 per cent. were supplied from Empire sources and 11 per cent. from foreign countries. These facts, Mr. Taylor submitted, would serve to emphasize the value of intensive propaganda and efficient organization, and he suggested that if such progress continued, before long, home orchards would be supplying a much larger proportion of the requirements of the home market.

AERIAL PHOTOGRAPHS OF RURAL AREAS

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THE air photographs taken for the revision of Ordnance Survey maps are on a scale, approximately, of 1:5000, or 12½ in. to the mile. Being photographic representations of the earth's surface, they depict a mass of detail, such as hedgerow trees, ricks, cattle tracks, rabbit burrows, etc., none of which are recorded on line maps.

All such features can be recognized on the photographs for what they are. Other features, though they are distinctly recorded, cannot be explained without examination of the photographs on the ground they portray. The photographs, however, through the bird's-eye view they afford, draw attention to them and invite investigation in the field. Without the photographs they would often pass unobserved by the man on the ground.

When used as maps, the photographs are easily read. Even farm labourers, to many of whom a line map conveys little, will quickly learn to orientate air photographs of land they know, and recognize many of the surface features depicted. Exactly what features the photographs show, depends to some extent on the season of photography.

From several points of view, photography in late winter or early spring is of special interest. For instance, a spell of weather suitable for photography often occurs in March, when the surface soil is exposed to view in the majority of arable fields. Fields sown in autumn, though green to the eye from ground level, photograph from 10,000 feet almost as if there were no crop at all. Yet areas on which the crop is advanced, on account of early sowing, good treatment, or favourable soil temperatures, can be distinguished from those on which it is late. Further, wet or heavy soils, by reflecting the light, photograph differently from dry or light soils. If suitable filters are used, the colours of soils are also differentiated as shades from white to grey.

At this time of the year, also, the differences in the soils show up more clearly in the pastures than at any other season. The differences in the soils under grass, of course, can only

AERIAL PHOTOGRAPHS OF RURAL AREAS

be judged indirectly by such features as the appearance of the grass, the breadth of lands or the seepage of water on the surface. Obviously, when interpreting the phenomena shown on the photographs, due allowance must be made for the effects of winter grazing, which, however, are generally plainly to be recognized. Grass land areas that have been dunged or limed are also clearly distinguished. Indeed, the condition of both pastures and temporary leys is easily assessed on photographs taken at this season.

Again, the state of hedges, hedgerow ditches and surface drains is revealed better at this time than at any other. When there are underwoods, their density and relative ages can also be estimated, while the shadows cast by the standards permit of their number being determined and roughly classified by sizes.

With photography later in spring, following the early growth of corn and the flush of new grass, the differences in the appearance of the cornfields and the pastures closed for hay are relatively small. Nevertheless, advanced growth is easily distinguished from tardy growth, a phenomenon that is emphasized in the event of an early summer drought. In that eventuality, any nitrogen deficiency in the land is clearly shown by the differential colouring of the vegetation. In the case of the fields open to pasture, selective grazing, the distribution of which is accurately recorded on the photographs, generally points to the areas with the most palatable grass mixtures. As regards woodlands, it is at this time of the year that the different tree species can be most easily distinguished by the varying shades of their foliage.

When photographs are taken between the hay and the corn harvest, the best record is obtained of the cropping. At this time it is generally possible to locate direct from the photographs, the hayfields, meadows, drier pastures and rough grazings, the temporary leys, cornfields, and potato, root, etc., crops.

As regards arable fields, the cleanliness of the crops and the effects of past cropping, dunging and manuring can generally be seen. Where cross-ploughing has been employed, this is very evident. On the lighter soils it is often possible to tell almost to a yard, where sheep have been folded and where not. The relative heaviness and evenness with which farm-yard manure has been added, can usually be judged. Attention may be drawn by the photographs to crops suffering

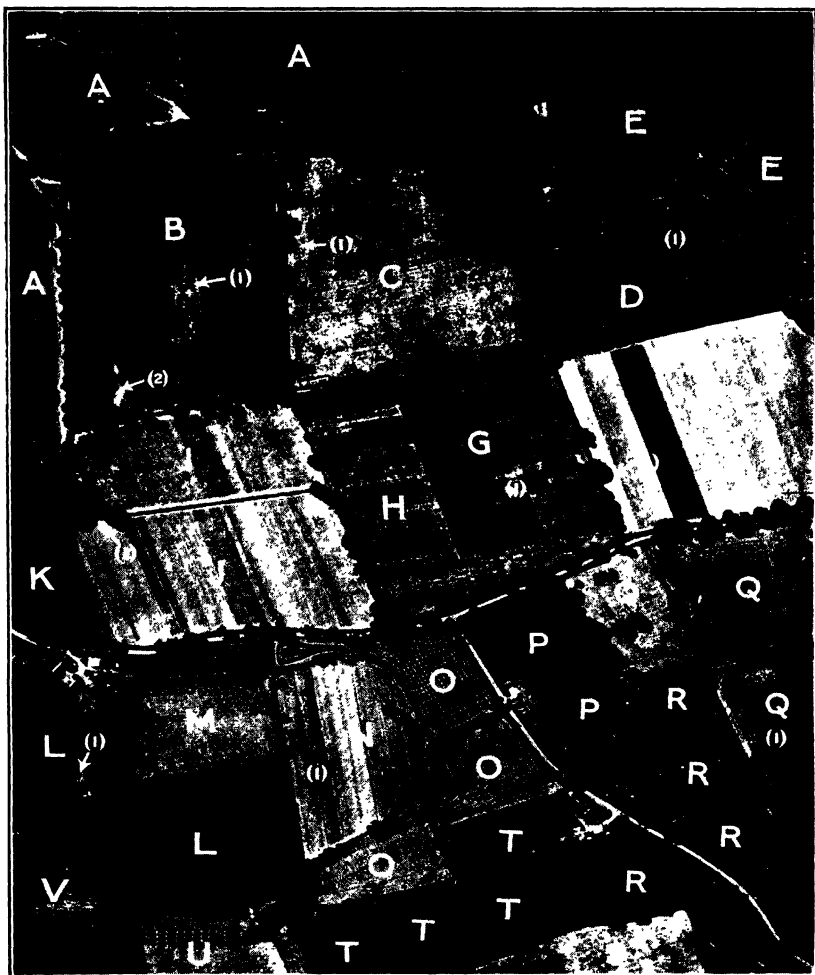


FIG. 1.

Photo: Aeroflms, Ltd.

- A. Permanent grass with many weeds.
- B. Red chaff wheat. Note: (1) dirty patch, (2) area damaged by shade and, in general, differential growth according to previous cropping.
- C. White chaff wheat. Note: (1) damage by shade.
- D. Oats. Note: (1) dark spots indicating better growth where dung has been heaped prior to spreading.
- E. Permanent grass reduced to *Festuca* sward by rabbits.
- F. Roots, etc. Note: (1) damage by shade.
- G. Oats. Note: (1) dirty patch.
- H. Old stubble unploughed. Note differential growth of grass according to previous cropping.
- I. Potatoes.
- J. Roots, etc. Note: (1) damage by shade.
- K. Wheat on land recently folded for sheep. Note traces of penning.
- L. Permanent grass in fair condition. Note: (1) Poaching of the ground where feeding has been undertaken.
- M. Hayfield already harvested.
- N. Roots, etc., and (1) potatoes.
- O. Hayfields in process of harvesting.
- P. Closed for hay, but left uncut. Grazing commenced.
- Q. Hayfields already harvested. Note: (1) old lands.
- R. Closed for hay, but left uncut. Note the lands.
- S. White chaff wheat, full of weeds and much damaged by pheasants.
- T. Permanent grass in fair condition.
- U. Hayfield in process of harvesting.
- V. Oats. Note: (1) dirty patches.

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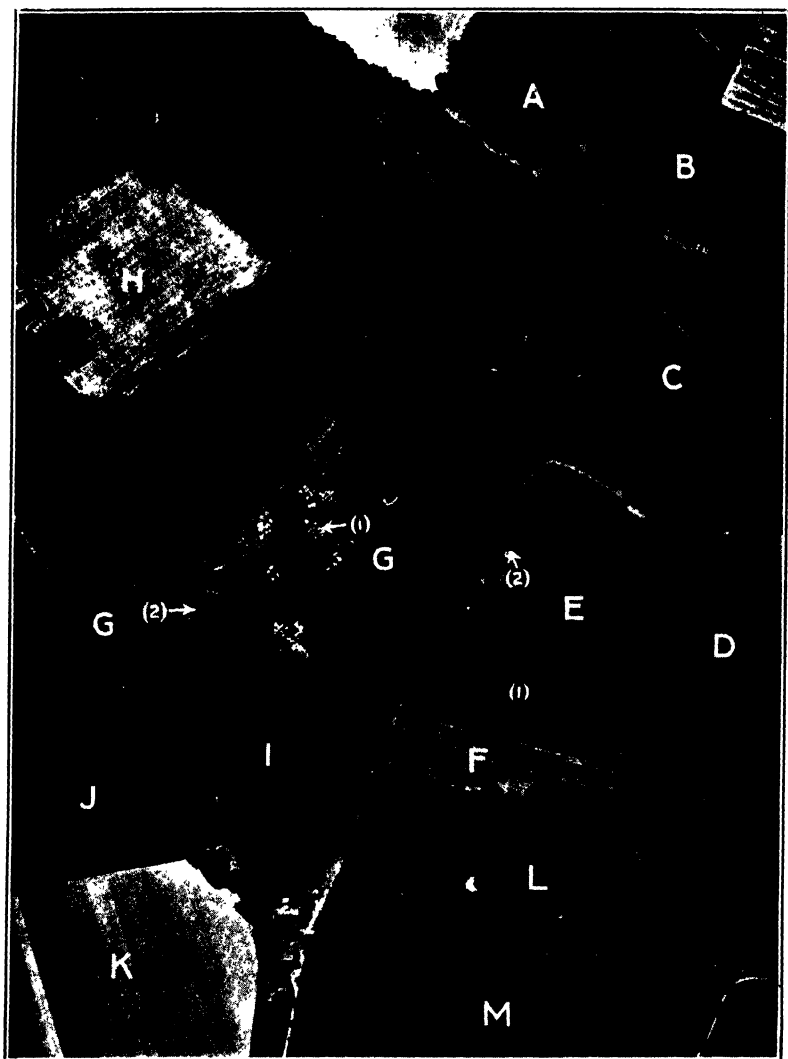


FIG. 2.

Photo: Aerofilms, Ltd.

- A. Tumbled down to grass.
- B. New plantation.
- C. Meadow with much rush growth and a few open drains partly cleared.
- D. New permanent grass (very thin).
- E. Oats. Note differential effects of previous cropping, including (1) folding with sheep. Also note: (2) damage by shade.
- F. Roots, or forage crop.
- G. Permanent grass, almost reduced to Fescue sward by rabbits. Note: (1) rabbit warrens.
- H. White chaff wheat; a dirty crop, much damaged by pheasants.
- I. Permanent grass with many weeds.
- J. Oats. Note dark spots indicating better growth where dung has been heaped prior to spreading.
- K. Roots, etc.
- L. Permanent grass in fair condition.
- M. Clover ley. Note differential effects of previous cropping and treatment.

AERIAL PHOTOGRAPHS OF RURAL AREAS

from potash or phosphate deficiency. Likewise, differences in crops may point to the previous heavy demands made on the soil by such crops as peas and maize.

In the cornfields generally, oats can usually be distinguished from wheat or barley; early crops from late; and differences in soil moisture are often indicated by differential growth or ripening of the corn. The actual areas damaged by rabbits or game, or in which the growth has been stunted by the shade of hedgerow trees, can always be recognized and their extent measured.

In grass land, apart from the clear-cut distinction between hayfields, meadows, drier pastures and rough grazings, it is generally possible to gauge the incidence of grazing, the frequency of weeds, the extent of rabbit damage and the general condition of the herbage. In the event of a drought, it is at this time, or even later in the year, that the presence or absence of underground drains in grass land is clearly revealed.

With photography in autumn, less is to be learnt from air photographs than at any of the other seasons mentioned. There is less differentiation in the grass land than at any other time. Again, stubble in the cornfields not only appears very similar, whatever the previous crop, but is a very effective blanket over the soil. The clover leys alone are distinct. As ploughing and treatment of grass land proceeds, however, the surface features approximate more and more to those met with in late winter or early spring.

This brief and general description of the seasonal aspects of the land surface, as seen from the air and depicted on air photographs, will perhaps give some idea of the uses to which they may be put by the agricultural community. Landlords, agents, tenants, owner-occupiers, county organizers, soil surveyors, and research workers, should be able to envisage the several ways in which, individually, they could profitably use air photographs of the land in which they are interested.

THE RABBIT IN AUSTRALIA : SOME SUGGESTED METHODS OF DESTRUCTION

GEORGE BERRIE

As rabbits have become a problem in Britain a brief outline of Australian legislation for their compulsory destruction, and of the methods applied, may be of interest and practical value to those who ask for similar action here. What rabbits have cost Australia in capital expenditure and ruined country cannot be calculated. Their complete extermination seems to be impossible, but in many districts drastic action and unceasing vigilance keep them to a minimum. With the aid of a healthy climate they breed alarmingly, have few diseases and can ignore natural enemies. Although they return a certain amount of revenue to the country from the export of skins and carcasses, they are regarded as vermin. It is even illegal to keep a rabbit as a pet !

The State of New South Wales is divided into districts, each of which elects a local body known as the Pastures Protection Board, and part of whose duties is to administer the laws relating to the destruction of noxious animals. The Board's revenue is derived from annual assessments on the live stock in its district, the rate-payers alone are the electors, and the members are invariably representative stockowners or farmers. Their position is honorary. The Boards also administer the Act, providing landowners with wire netting on extended terms at low interest rates.

When a district is declared rabbit-infested—and there are few districts that are not—the controlling Board appoints a rabbit inspector. The inspector travels continuously over his area, which may cover thousands of square miles, and if he finds that landholders—large or small—are not keeping their rabbits in reasonable check, they are served with notices to do so. If on a further inspection, say, in three months time, it is found that the notice to destroy has been ignored, the delinquent landholder is summoned and fined unless he has some reasonable excuse. The maximum penalty is £100 (one hundred pounds), and the Boards do not hesitate to take drastic action when necessary.

In favoured districts, where settlement is small and land of high value, landowners seldom need spurring to action, but

METHODS OF RABBIT DESTRUCTION : AUSTRALIAN SUGGESTIONS

in poorer localities—particularly where there are large areas of unoccupied lands, usually of inferior quality—the problem of the invading rabbit is very acute. Consequently, the first step taken by any landholder who means to tackle it seriously is to fence his boundaries with rabbit-proof netting.

A standard rabbit-proof boundary fence would be as follows. Stout wooden posts—split for choice—sunk 22 in. in rammed ground and standing 46 in. out, are placed 11 ft. apart. Four plain steel galvanized wires—the first three at 12-in. intervals from the ground—are run through holes bored in the posts, and one barbed wire is placed on top. The netting is trenched 6 in. in the ground, and stands 3 ft. out of it. Its mesh is $1\frac{1}{4}$ in., its gauge No. 17, and it is heavily galvanized. This is an expensive fence to erect, but apart from its being a necessary barrier to rabbits, it makes an absolutely stock-proof boundary. Few landowners would care to be without one, even if there were no rabbits.

What it may cost to get the last rabbit from a badly infested holding may be illustrated by an instance within the writer's experience. The station in question was one of 40,000 acres. It had been badly neglected, its netted boundaries allowed to fall into disrepair, and its whole area was literally swarming with rabbits and riddled with warrens. A new manager was given instructions by the owners to clean the place up—no matter what it cost. He put the boundaries in order, and subdivided the area into four rabbit-proof blocks. All fallen timber was stacked and burnt, every hollow tree, green or dry, came down. The warrens were dug out, ploughed out, and in the case of rocky outcrops, concreted in. Many thousands of rabbits were destroyed in the process, and the final stage was the employment of gangs of men with mobs of dogs. They harried the homeless rabbits until they actually did get the last one of a number impossible to estimate. The total cost to the station was a little short of £10,000 (5s. per acre), but either the rabbits or the sheep had to go. The amount was soon recouped from the increased stock-carrying capacity of the land; and once it was cured of "rabbit sickness," certain specially fattening herbage soon reappeared.

The general methods of destruction—short of systematic digging-out—are trapping, bait poisoning and gassing. When skins or carcasses are high in price, trapping will reduce numbers considerably, but the trapper naturally leaves sufficient rabbits to breed up, and—setting his spring-traps at

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buckheaps, as he does—he encourages breeding by destroying more males than females. Poisoned baits have wiped out uncounted millions. For years pollard was favoured, but it took a serious toll of bird life, and is seldom used to-day. It was distributed into a small ploughed furrow from a specially designed horse-drawn vehicle. * Poisoned jam—quince for choice—and thistle roots are particularly effective, with the added advantage that, except by accident, nothing but rabbits will touch them. Gassing is now universal, and the types of machines used are numerous. They vary from small hand-operated affairs that can be carried about, to power-driven plant carted on a lorry. One common feature to them all is the pumping of ordinary black smoke into the warrens before they are closed up for gas poison. Small holes or ground cracks that might easily be missed are thus quickly disclosed. The Australian farmer rarely gets any return from rabbits, nor does he look for it. He is usually only concerned with getting rid of them.

It is very unlikely that any such system of compulsory destruction will ever come into force in Britain. The use of netting seems impracticable except for special areas. Bait poisoning is—for obvious reasons—out of the question. Gassing has been successfully tried, but as a method it has the drawback that the carcasses are lost; while trapping seems to be dependent on the price of carcasses, and is badly handicapped in a severe winter. The British farmer, who looks to rabbits to give him some sport occasionally, must so restrict their numbers that they do not become a nuisance.

Two methods of wholesale trapping that are successfully followed in Australia should be equally effective here, and at small cost. They would enable a farmer to keep his own rabbits—and particularly those invading him from a neighbouring farm—to a minimum, and yet make a small dividend from them even when the price of carcasses is low. One is a netting yard, the other a pit trap.

The netting yard (Fig. 1) would probably be most effective where rabbits are coming from some congested cover such as a small wood or railway embankment. The site for the yard is selected in a central position on the edge of the cover, and its size will depend on the number of rabbits likely to be trapped in a single night—say 15-ft. square. It needs to be very strongly built with posts and stout-gauge netting let 6 in. into the ground, and its height should not be

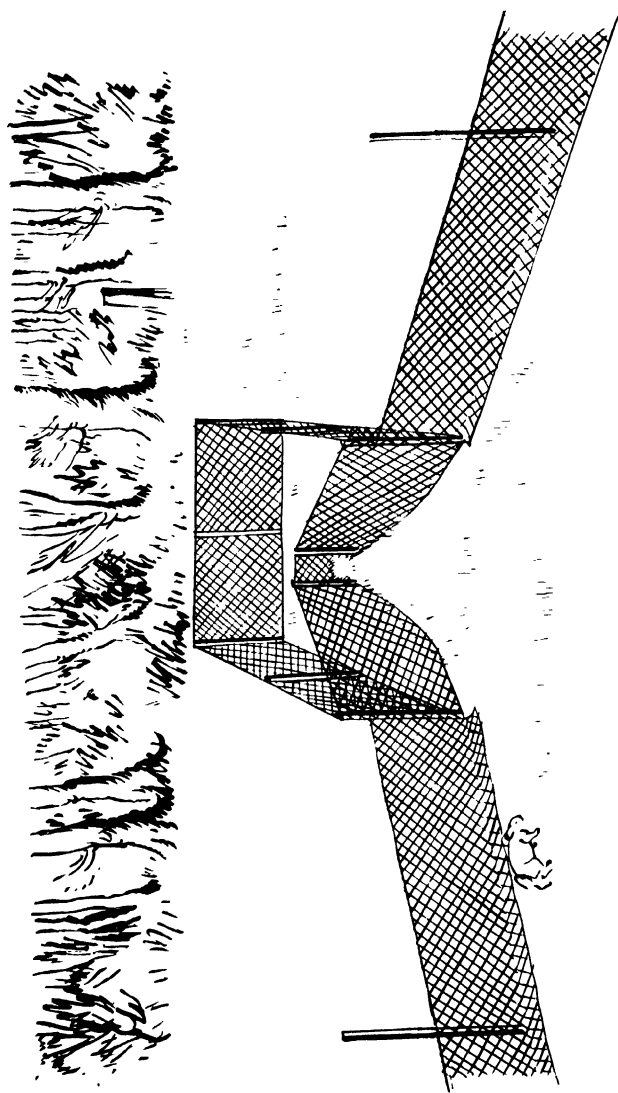


FIG. 1.—Nitting yard for catching rabbits (see page 934).

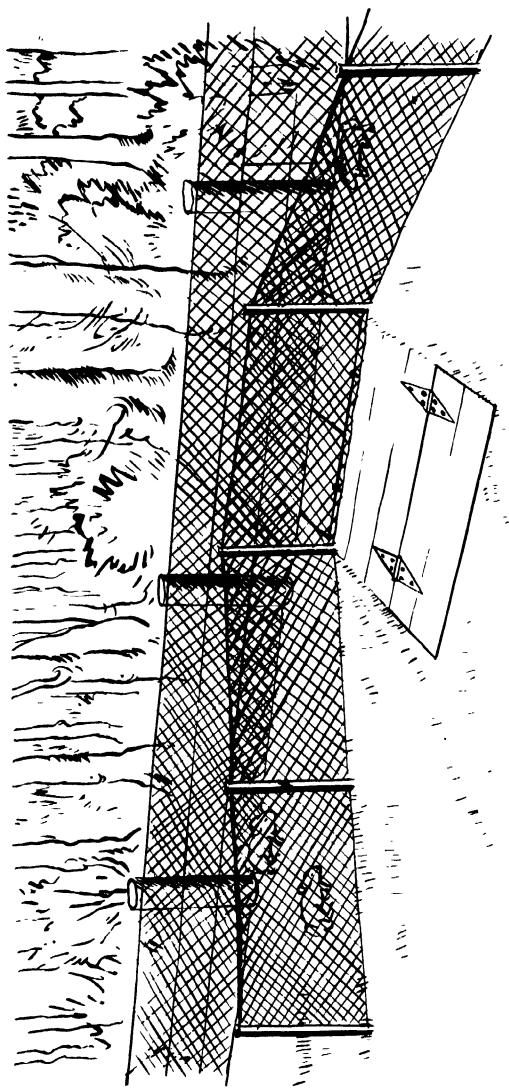


FIG. 2.—Australian form of pit trap for catching rabbits (see page 935).

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

less than 5 ft. above ground. Facing *outwards*, to meet the homecoming rabbits, a V-shaped entrance is made into the yard, finishing between posts sufficiently far apart to allow a rabbit to pass comfortably. The ground immediately approaching the entry point is turfed up gradually to a height of about 12 in., and, an inch or so above it, one mesh of the netting is cut and the prongs are turned inwards into the yard. The rabbits, when inside, are well below the entrance, and are moving round a sharp corner. If one does find its way out, it is a lucky fluke.

The rabbits are persuaded into the yard in the following way. From each corner of the V entrance, and running at a sharp angle to the rabbits' line of approach to their feeding ground, a row of light pegs is erected, and the distance is governed by the area of the cover. It might be a couple of hundred yards on either side. On the pegs—which can be placed, say, half-a-chain apart—light-gauge netting is hung so that it will lap a few inches on the ground. Until after nightfall, the netting is left tied up to allow feeding rabbits to pass easily underneath on their outward journey, and some time during the night it is released. The rabbits on returning towards their cover find the netting barricading their path and as its angle is guiding them more or less homewards, they follow it until they come to the V entrance to the yard. Unless British rabbits differ very vitally from their Australian relatives, they will find their way in. Should there be an old netting-fence, and the rabbits coming through holes or broken meshes, it may be used instead of the temporary wings merely by facing *two* V entrances *along* the fence instead of outwards and blocking up the holes at any time after dark.

It will be noted that no attempt is made to *drive* the rabbits into the yard. The whole theory is to persuade them into it in the expectation of getting home. The cost of the netting required is not high, and if carefully handled could be used for years. The yard can either be made a permanency, or in sections hinged or hooked together to enable it to be moved from place to place.

In Australia, the pit trap (Fig. 2) is usually placed on a netting fence that rabbits often follow in waves—looking for fresh pastures. The size of the pit varies, but 3 ft. is deep enough, and the sides may be timbered if necessary. The top is covered partly by a lift door, but *against* the netting

METHODS OF RABBIT DESTRUCTION: AUSTRALIAN SUGGESTIONS

fence there is a narrow runway sufficiently wide to allow a rabbit to pass along comfortably. At both ends of the runway there is a balanced board, bedded level at the entrance. These boards are so weighted that as soon as the rabbit passes the centre it is tipped into the pit. The rabbits are guided on to the runway by means of short netting wings at a sharp angle from each end.

Here, pit traps could be placed on existing netting fences out of repair, or on temporarily-constructed wings. In either case, the procedure would be the same as with the netting yards. There is no exaggeration in the writer stating that he has seen large pits so full of smothered rabbits that the drop boards could not work.

THE RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

A. V. CAMPBELL,

Ministry of Agriculture and Fisheries.

LACK of water in a Norwegian salmon river caused the writer to interrupt a fishing holiday and turn his attention momentarily to agriculture by way of a visit to the Jordbruksskule, or Farm Institute, at Mo near Førde in Sojnfjord.

Førde is situated on the west coast of Norway some 70 miles north of Bergen, and set back some 30 miles from the open sea at the end of Vevring Fjord at a latitude slightly north of the Shetland Islands. It is an area of long shadows, and, during the summer, light nights, and enjoys a not unpleasant climate. Spring here lags behind the English spring by about a month, while during the winter, snow, although not deep in the valleys, puts an end to many outdoor activities. These two factors, as would be expected, largely determine farm practice.

The countryside may be pictured as a series of narrow valleys, many of which are about a mile wide, at the foot of mountains covered up to the snow line with conifers and silver birch, while rough grazing exists in the more open spaces. In the numerous valleys, small farms with picturesque wooden buildings are dotted about.

As regards food, the standard of living is high, and the first concern of life under such conditions is to maintain an adequate supply. Other bodily requirements, such as clothes, etc., come mainly from the exchange of timber and dairy products. Hence, after farming come woodcraft, sawing, lumbering and carpentry as questions of the first importance, since it is by the exchange of sawn timber and fish boxes, which are made in quantity, that the additional requirements of life are obtained. Recently silver-fox farming has been added to those occupations.

The cultivable area that constitutes a farm is usually small, and the care that is bestowed on this indicates the pressing nature of the land hunger that exists. Added to the cultivated fields are areas of high ground in which the occupier, who is

RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

usually the owner, has the right of tree felling. These highland areas, which are called "seters," are usually unfenced, and while the right of tree cutting is personal to the owner on his particular holding, grazing rights are owned collectively by adjacent farmers. The natural soil is in many parts often a series of extremes, being 'either of a sandy nature or pure peat, while old settlements have usually been made by years of consolidation, manuring and mixing of the extreme types in much the same manner as one would marl land in England. The winning of a livelihood under such conditions, however, appears to be no easy task, and, although certain compensations in the form of cheap power, light and telephonic communication are available, the scattered nature of holdings calls for resourcefulness and thrift. Content as implied by English standards does not in Norway appear to be measured altogether in terms of bank balances.

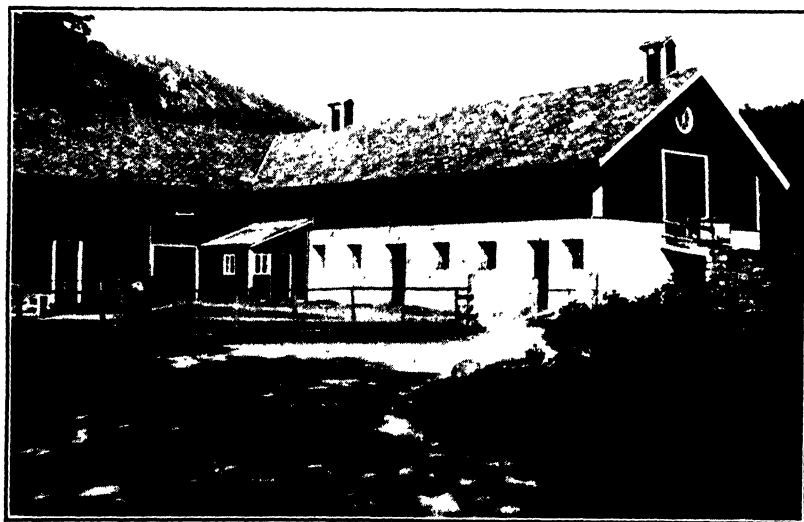
A good and plentiful supply of certain types of home-produced food is obtained from both land and water, while that not required for immediate consumption is, when possible, preserved for winter use. So finely is the balance held that little money is available for luxuries.

It is small wonder, therefore, that the teaching at the Farm Institute at Mo is designed not only with the idea of stimulating thought and creating interest in a life that may become somewhat solitary were it not for the telephone, with which almost every holding is equipped, but also to give a very thorough technical training in all branches of rural economy and crafts—a training which would, indeed, have delighted Cobbett.

The Farm Institute at Mo consists of hostel (Fig. 1), farm buildings (Fig. 2) and dairy, made, as would be expected, of wood standing on a substantial concrete footing, which provides also for a basement with a frost-proof chamber. The school has been in existence some 80 years. It is situated on its own land, bordered on one side by a mountain range and on the other by a river into which a waterfall some 300 ft. high pours incessantly, except during the winter months, when the feeding lake becomes icebound. The low-lying land is mainly peat, while the higher ground is often light and sandy. The area under grass is about 20 acres, while another 16 acres are under rotation. In addition there is a fairly large area of woodland that provides scanty grazing.



FIG. 1. — Hostel and lecture rooms at the Farm Institute, Mo, Førde, Sonnfjord, Norway.



Photos · A. V. Campbell.

FIG. 2. — Farm Buildings at the Farm Institute, Mo, Førde, Norway. The cow byres are on the ground floor, with hay loft and food store over. It is possible to drive a horse and cart through the loft, which is reached by the ramp seen on the right of the view.

To face page 938.



FIG. 3.—The dairy herd at Mo, Førde, Norway. In the background can be seen the spray rising from the Fairy Falls.



Photos. A.V. Campbell.

FIG. 4.—The dairy herd is composed of small animals not unlike our Shetland Island breed. Note the wire fencing (in the middle distance) separating the grass plots, which are grazed rotationally.

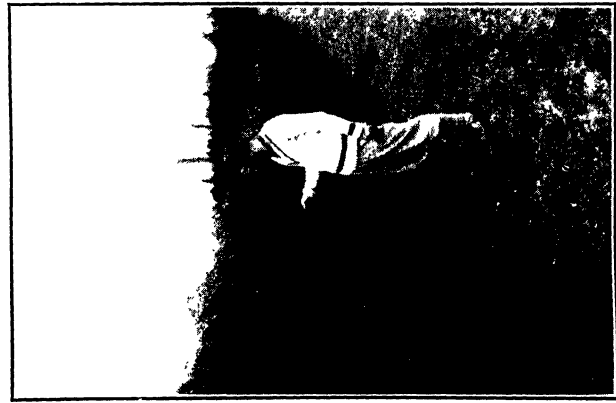


Photo · S. Fisk.

FIG. 5.—Method of drying grass by hanging on wire fence. Norway.

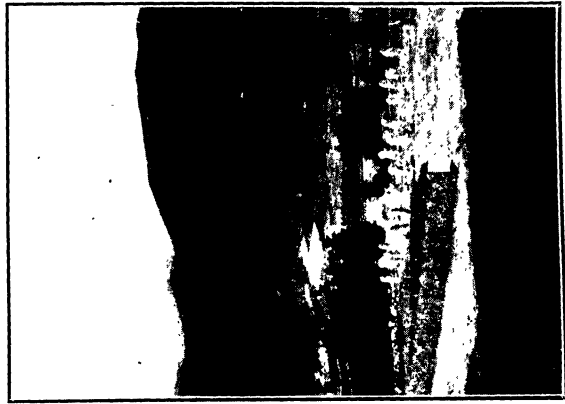


Photo : F. Davey.

FIG. 6.—Potatoes in the foreground ; hay drying on fences ; and stooks of oats.



Photo : Miss A. Spencer.

FIG. 7.—Hay drying on racks. Norway.

RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

Twenty-eight cows of the Vestland Fiord type are kept. These are small beasts not unlike the Shetland Island breed (Figs. 3 and 4). All are carefully recorded and rationed; in addition the herd is kept free from tuberculosis. The average milk yield is roughly 550 gal., while the best examples of the breed approach 875 gal.

Sixty sheep of a Cheviot cross type, 3 horses and a number of pigs of Large White type complete the live stock, with the addition of a few goats and a small head of poultry. At first sight, having in mind the amount of rough grazing available, one wonders why the sheep population of the nearby countryside is not larger, but the answer is found in the difficulty of providing winter keep, for all sheep must be housed and hand fed, owing to their inability to live out of doors during the period of winter snow. Surplus milk from the dairy herd, after providing for local requirements or for teaching purposes in butter and cheesemaking classes, is consigned to the Dairy at Førde, from which centre it is issued or made into butter or cheese, of which large quantities are consumed.

It is not to be wondered at that, as farm-grown foodstuffs are so valuable by reason of the lack of land, every device is used to obtain the maximum output in its most palatable form. Economy has determined that rotational grazing of the pastures that contain much timothy and wild white clover should be practised. Considering that the low-lying pasture land is pure peat, the texture of the sward and the bite it affords is surprising. Both hay and silage are made by the ordinary and A.I.V. processes. The hay crop is of particular interest in view of the point that is being made in England at the moment that young grass provides the best food. Whereas for economic reasons mechanical drying would probably not be possible in this part of Norway, the same result is obtained by the accepted plan of making two cuttings in the young stage, the hay being dried on light wire fences that intersect the fields (Figs. 5 and 6). Most of the hay so taken is rotational, the practice being to leave the lay down 3 to 4 years, taking turnips, potatoes and oats as the other crops in the rotation.

In addition a small area is allotted to vegetable and fruit crops. Apples are at the moment receiving increased attention and trials with malling stocks show that grafts on 9 and 2 stocks may prove an asset to the countryside. A small glasshouse has recently been erected. This is heated by

RELATION OF THE FARM INSTITUTE TO LIFE IN NORWAY

electricity, the cost of which is low when compared with English charges.

The staff consists of a Director and an Assistant Director, who divide the work of teaching both practical agriculture and imparting some knowledge of the underlying sciences. In addition, another member of the staff deals with garden produce both in its outdoor and indoor aspects. Foremen-instructors supervise other technical subjects, for it is highly necessary that students should have a thorough training in wood and metal craft, in view of the fact that in after life they may be called upon to fashion or mend any of the implements which they may require.

Before admission to the college, students must have attained the age of 18 years and have reached a good standard of education in the junior schools. Payment for accommodation and instruction is 1s. per day, the balance of finance being found out of farm profits, Government and communal aid. Students undertake practically all the work on the land as a part of their instruction and are also given instruction in animal management, dairying, etc. Accommodation is provided for 60 students, who take a two-year course that lasts from October to April each session. The condition of farm life demands that the teaching at the college should be related to the practical requirements of the life, although the academic side, which includes literature, is by no means neglected. The fundamental aim is to equip a young man with knowledge that will enable him to emulate Robinson Crusoe if necessary, and, starting with power and timber, to fashion not only a farm, but the house he will live in and the many incidental requirements. Lumbering, sawing, including the setting up of the mill, the harnessing of electricity delivered to him, making of wheels, chains, building, etc., all form part of instruction in handwork.

THE ASPARAGUS FLY

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The Asparagus Fly (*Platyparea pœciloptera* Schr.) is a native of Central and Southern Europe, but appears to be spreading slowly westward. About the beginning of the present century it was found in the neighbourhood of Paris and it has since become a serious pest in the valley of the Seine, where asparagus is largely cultivated. In 1931 it was first reported from Holland. So long ago as 1904, the (then) Board of Agriculture issued a leaflet on the insect and this has led to the assumption that the pest had been observed in England. There seem, however, to have been no grounds for this supposition, and, in point of fact, the insect was not known in this country until 1935, when an asparagus bed in a private garden in Hertford was found to be heavily attacked. Subsequently, numerous instances of infestation have been found in gardens in South Hertfordshire.

The Asparagus Fly is a member of the family Trypetidæ or Fruit Flies, which is most strongly represented in warm climates, and includes, abroad, such well-known pests as the Apple and Cherry Fruit Flies and the Mediterranean Fruit Fly, and, in Britain, the Celery Fly.

So far as is known, asparagus is the only cultivated plant attacked by the fly, and this is injured by the larvae (or grubs) which tunnel in the stems (Fig. 4). The loss resulting from the attacks is two-fold: first, there is that due to actual distortion or killing of the early shoots which would otherwise be cut for the table, and secondly, the effect of the attack on the later growth which is normally left to develop naturally. In this country, owing to the comparatively late emergence of the flies, the first source of loss would seem likely to be of little importance: cutting has largely ceased before the attack commences. The attack on the later growth, however, may be very serious: the crowns will be increasingly weakened year by year and an attacked bed will sooner or later become unproductive.

The adult Asparagus Fly (Fig. 1) is similar in general appearance to the well-known Celery Fly, but is slightly larger, and the black markings on the wings are more

THE ASPARAGUS FLY

extensive. On the Continent of Europe, the flies begin to emerge towards the end of April and continue to appear until mid-June. Under English conditions, however, emergence is apparently later; in 1936, it started in early June and continued until mid-July.

In dull weather, the flies are sluggish and can be seen resting on the plants or walking slowly over them, moving their wings up and down. On bright, warm days, they become more active, flying readily, but only for short distances. Pairing takes place soon after emergence and egg-laying is begun a few days later. The eggs, which are white and oval in shape, are inserted singly in the asparagus stems just below the skin, usually near the growing point, or, when older stems are attacked, in the neighbourhood of the "leaves." In a few days these eggs hatch, giving rise to tiny white cylindrical-shaped maggots, which tunnel down the stems, feeding on the tissues; several of these grubs may be found in a single stem. When young shoots are attacked, the feeding of the grubs causes them to twist and become distorted: they remain dwarfed and usually die before producing "leaves." With older stems, little distortion is produced, but such stems die off earlier than healthy ones, and may be recognized in late summer by their premature yellowing (Fig. 5).

In about three weeks to a month the grubs (Fig. 2) are fully fed and they are then about $\frac{1}{2}$ in. long and yellowish white in colour: the front segments are slightly tapered with two mouth hooks, while the posterior end is flattened, dark brown, and provided with a small forked process.

Pupation takes place in the stem, usually near or just below ground level. The puparium (Fig. 3) is barrel-shaped, about $\frac{1}{3}$ in. in length, and is slightly flattened on one side, with a short anchor-like process at the hinder end. The colour is light brown at first, becoming darker later.

As mentioned above, attacked stems die off prematurely: they are also weakened by the larval tunnels and frequently break off at or about soil level. The underground part of the stem then rapidly decays and the pupae fall into the soil, where they remain during the winter.

The flies do not emerge from the puparia until the following spring, there being but one generation in the year. Owing, however, to the lengthy period during which the flies are on the wing, newly-hatched larvae and pupae may be found at the same time, and even in the same stem.

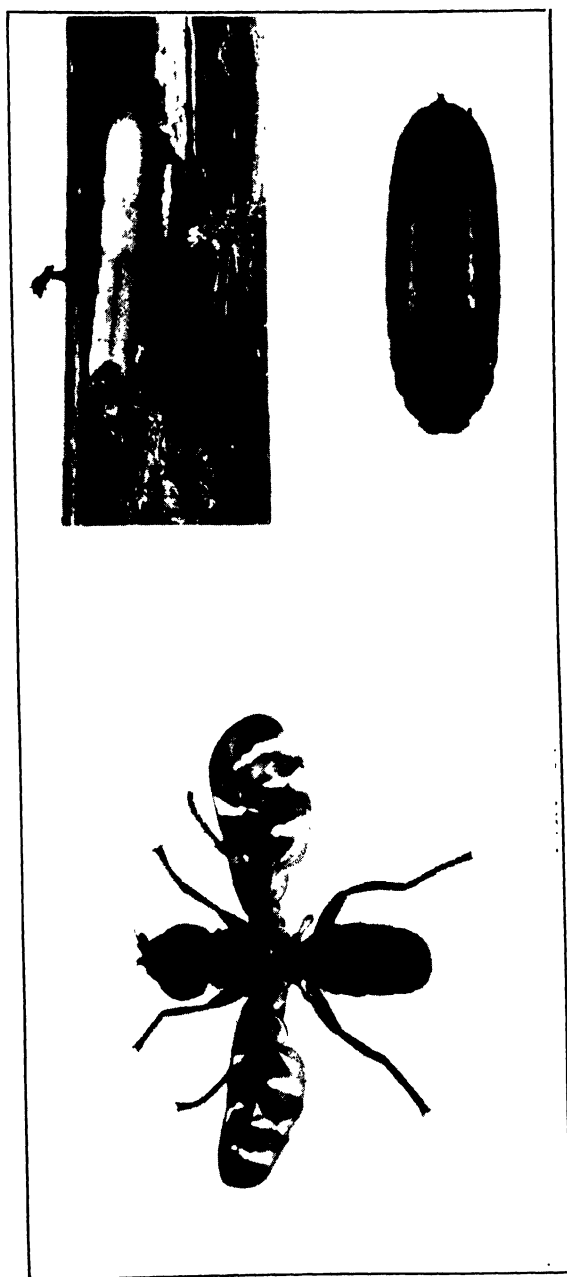


FIG. 1.—Asparagus fly.

FIG. 2 (top).—Larva in stem
FIG. 3 (bottom).—Pupa.



FIG. 4.—Tunnels in asparagus stems.

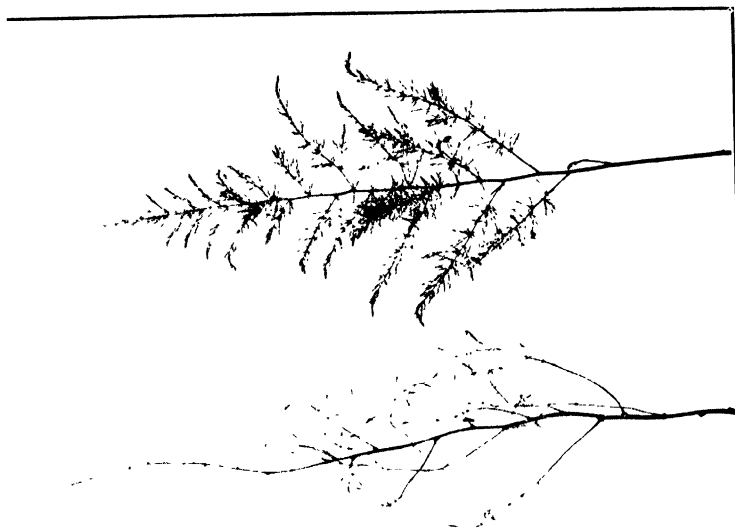


FIG. 5A (left).—Attacked shoot (note distortion of stem).

FIG. 5B (right).—Healthy shoot.

THE ASPARAGUS FLY

Various control measures against the pest have been tried on the Continent, but none has proved entirely successful. The recommendation most generally adopted is to cut and burn the stems as early as possible in autumn. By this means, large numbers of the pupae will be destroyed; but, on the other hand, many will be left in the underground portions of the stems and in the soil, and at best the infestation will only be reduced to a greater or lesser extent. Measures to kill the adult flies before they have laid their eggs have been suggested; these include spraying with nicotine, baiting with poisoned sugar solution and trapping by means of sticks, roughly shaped to resemble asparagus heads and covered with sticky material. Only the last of these methods has proved in any way effective, and only a partial reduction is obtained in this way. Spraying is not economically possible, owing to the protracted flight period of the flies, and they are not attracted to any form of sweetened bait that has been tried. It has been found that the flies are unwilling to lay eggs on asparagus that is surrounded by higher vegetation; and, in some instances, attacks have been considerably reduced by interplanting the rows of asparagus with cereals.

As none of the above measures appear to offer a satisfactory control of the pest under English conditions, experiments are now being carried out with a view to obtaining a soil insecticide that will destroy the overwintering pupae. On a small scale, an emulsion of carbon disulphide has given promising results, but no definite recommendations can be made at present. Destruction of the affected asparagus does not, unfortunately, result in the eradication of the pest, since there is no time of the year in which there are not puparia in the soil. When a bed has become so unproductive that it has to be done away with, the best time to dig it up is about the first week in July, when the plants should be removed and burned. Asparagus should not be replanted on the same site or in the immediate vicinity for at least a year.

On beds that still produce a reasonable crop, the only measures that can be suggested at the present time are:—

1. To remove and destroy any distorted stems during the growing season.
2. To cut and burn the stems as early as possible in the autumn, taking care that they are cut as near the crown as possible.

EIGHTEENTH-CENTURY CROP HUSBANDRY IN HERTFORD AND MIDDLESEX

G. E. FUSSELL,

Ministry of Agriculture and Fisheries.

FARMING in Hertfordshire, which was largely an arable county, has been eulogized by Ernle,^{1*} but the heavy two-wheel plough used, meets with no commendation from contemporary writers, although a similar implement was used all through the Chilterns and west through Berkshire, Wiltshire, etc.² It was not considered satisfactory by Mortimer, who had known it to fly out of the land and make poor work, involving the re-ploughing of the land a number of times.³ Much of the arable was worked on the three-field system,⁴ but quite a large proportion of the county was enclosed, and it is, therefore, esteemed as one of the counties, with Essex, Kent, Berkshire, Surrey, Wiltshire, Somerset, Hampshire and others, where people lived happily and were able to supply corn to open-field counties.⁵ Certainly, in the early years of the century, people were fined for unhusband-like practices, such as not scouring watercourses, or for stopping up ditches and encroaching on the commons.⁶

A great deal of field drainage, by means of the so-called hollow drains, i.e., a narrow trench half filled with stones or brush wood and filled up with soil, was done during the first forty years of the eighteenth century, and this was the more necessary in some districts because the arable is complained of as being either too much gravel or too much clay.⁷ Arrangements had been made by the farmers of the Chiltern common fields before the end of the seventeenth century, whereby turnips could be grown on them,⁸ a most unusual arrangement; in other counties at that date, it was only on enclosed land that rich landlords were able to introduce turnips and clover. The clover in this county was usually sown under oats, or with peas and beans, instead of barley as in East Anglia.⁹ Peas were grown every year on the Chilterns "for refreshing land and fodder of stalks in winter and spring."^{9a}

Manures such as rags, horn shavings, and soot were brought down from London, usually in the barges, carts and waggons that had taken up the corn, and buckwheat was

* For references, see pages 946, 947.

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ploughed in for green manure: where sainfoin was grown on the chalk it was sometimes, like clover, used for this purpose as well as for fodder.¹⁰ Chalk was used on the clay, and clay on the gravel, and the practice of folding sheep on turnips on the enclosed lands excited Kalm's admiration in 1748.¹¹ In spite of all this, the farmers of Berkhamsted were condemned by Ellis for looking to their wheat crop to pay their rent, and having little straw for fodder because they did not chalk their lands, so being obliged to buy horse fodder from better farmers,¹² but this was perhaps a little unjust. He declares that the best farmers were about Ivinghoe, where the land, double-dressed by the fold and carted dung, frequently returned as much as forty bushels an acre,¹³ but, if we may believe Kalm, they were no better off for straw fodder, because in that woodless district they were forced to use the straw as fuel.¹⁴ Moreover, the sheep were turned on to the young wheat in the spring,¹⁵ and the practice of growing tares for horse fodder supplied that need.¹⁶

There was some excuse for the wheat farmers in this county. The variety cultivated was known as Red Lammas or Kentish, and the flour, known as Hertfordshire White, was said to be in many respects superior to all other kinds.¹⁷ Barley and oats were also extensively cultivated, and Ellis recommends the use of the spiky roller on the first. In his day, barley was specially prominent in the district round Baldock, Hitchin, Royston and Ware.¹⁸ He also mentions that peas were sown in drills and that beans were dibbled in the Vale, by means of a plough with a hopper fixed to it which dropped the seed at regular intervals.¹⁹

The majority of the farms in the county at the end of the century were of about 150 to 400 acres, while many were much smaller and few larger.²⁰ The implements used had not materially changed during the hundred years, although in his report²¹ Young mentions four threshing mills, and the earlier report does not describe the farming as being so very different from what it was in Ellis's time.²² Bradley's remarks about the prevalence of the three-course system must, I think, be taken with a grain of salt, because, in a county where turnips were sown in open fields, the three-course system had broken down before the end of the seventeenth century. Young, indeed, thinks the farming of the county had been at a standstill for a hundred years.²³ This is, of course, obviously not quite true, if only on account of the draining

done in the first half of the century, but what it amounts to is that the county was one of the first to adopt the improved agriculture of the late seventeenth century, particularly the new grasses and turnips, and that it did not progress much after it had adopted them.

Middlesex was in the main famous because it contained London and vast heaths, but its arable 'was subjected to constant cropping. The course seems to have been wheat, followed by peas at the end of October, gathered green for market in May or June or fed off in the beginning of July, then plough for turnips, which were off by the following January. Kidney beans were then sown in April and gathered in September, after which beans were set in October to stand the winter, and a further succession of market-garden crops followed;²⁴ but whether we can accept this or not is undetermined, because Bradley gives a long succession of crops which would have occupied many years after the book was written. There is no doubt that a great many market-garden crops were grown, because the whole requirements of London in vegetables, etc., were supplied from within a twelve-mile radius of the City.²⁵ The Middlesex fields were like gardens and the farmers were half gardeners. It was only nine years since onions had become a field crop and twelve since kidney beans had been raised in the fields about Battersea and Wandsworth²⁶ in Surrey: cabbages were likewise field crops.²⁷ At the end of the century there was not much change. The first report tells us that the land was mostly meadow for hay for the London market, and that manures were obtained from London,²⁸ but the second states that the arable was not confined to the open fields, that the east of the county was in the old three-field course of wheat, barley, fallow, but that fallowing was given up in the main, and the west went in for wheat, peas and beans, the last two being hoed. Green and root crops were cultivated in great abundance, and still the manures were obtained, as they obviously should have been, from London,²⁹ so that no great change had taken place here.

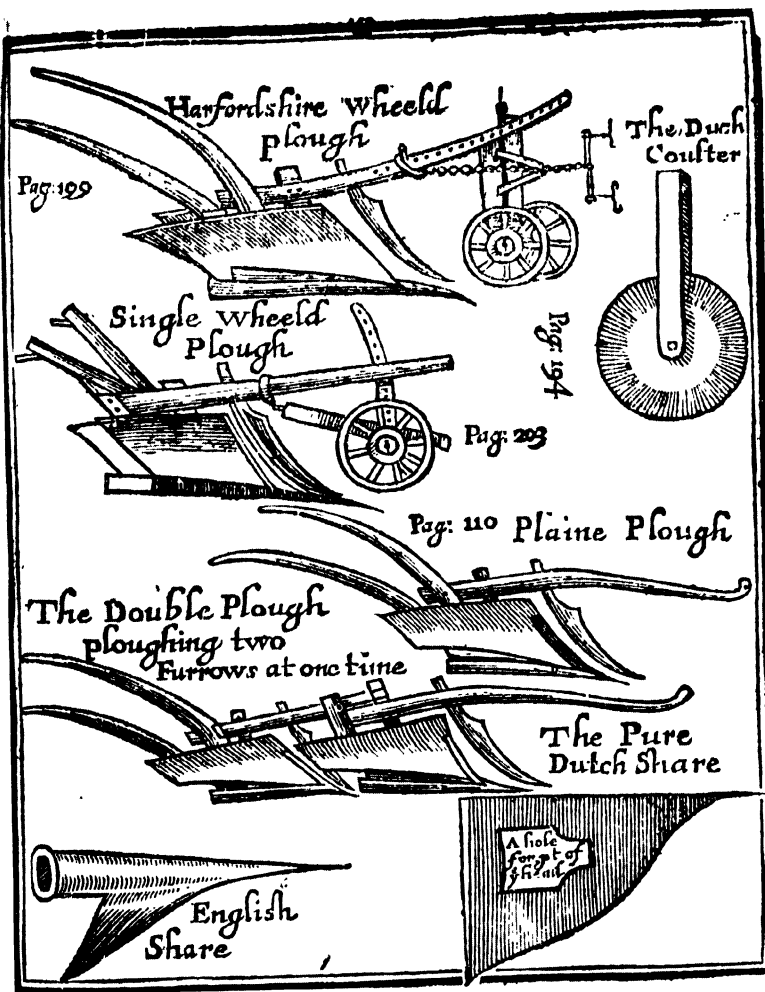
¹ *English Farming, Past and Present*, pp. 190-191.

² John Mordant: *The Complete Steward*, 1761, p. 273.

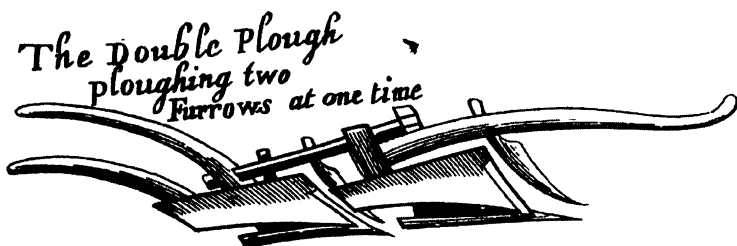
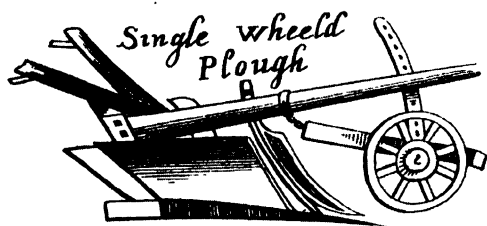
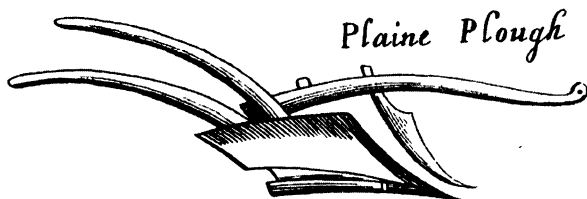
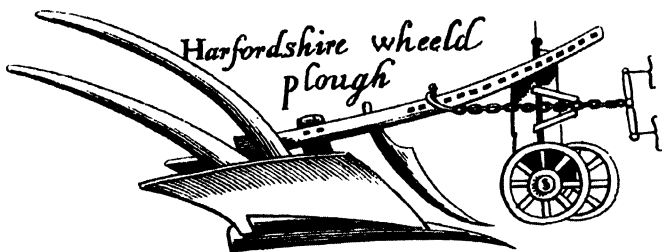
³ *The Whole Art of Husbandry*, 1707, p. 43 ff.

⁴ R. Bradley: *Complete Body of Husbandry*, 1727, pp. 247, 284. Matthew Peters: *Rational Farmer*, 1771, p. 95 ff.

⁵ Leonard Meager: *Mystery of Husbandry*, 1697, p. 132. T. Hale *Compleat Body of Husbandry*, p. 289 ff.



Reproduced from Walter Blith. *The English Improver Improved*, 1653.



Reproduced from John, Lord Somerville. *Facts and observations relating to sheep . . . ploughs . . .* 1803. Lord Somerville expressed the opinion that no marked change had taken place in the Hertfordshire type of plough in the 150 years between Blith's book and his own.

18TH-CENTURY CROP HUSBANDRY: HERTFORD & MIDDLESEX

- ⁶ W. J. Hardy: *Hertfordshire County Records*, II, pp. 27, 28, 34, 36, 40, 42.
- ⁷ N. Salmon: *History of Hertfordshire*, 1728, p. 1. S. Simpson: *Agreeable Historian*, 1746, II, p. 252. W. Ellis: *New Experiments in Husbandry for the Month of April*, 1736, p. 14.
- ⁸ W. Ellis: *ibid.*, p. 12; *Modern Husbandry*, IV, June, p. 30-31. See also C. Varlo: *A New System of Husbandry*, p. 287.
- ⁹ W. Ellis: *ibid.*, p. 62; see also *Modern Husbandry*, Feb., p. 89 ff.
- ¹⁰ *Modern Husbandry*, *ibid.*, p. 39.
- ¹¹ R. B.: *Treatise Concerning the Manner of Fallowing of Ground*, 1724, p. 31. Robert Brown: *The Compleat Farmer*, 1759, p. 111. T. Hale: *op. cit.*, p. 18.
- ¹² *Kalm's Account of his Visit to England*, 1748, translated by Joseph Lucas, 1892, p. 281.
- ¹³ *Chiltern and Vale Farming Explained*, 1733, p. 24.
- ¹⁴ *Ibid.*, p. 9 ff.
- ¹⁵ *Op. cit.*, p. 276.
- ¹⁶ *Ibid.*, p. 282.
- ¹⁷ Ernle: *op. cit.*, p. 191, citing Ellis and Young.
- ¹⁸ John Laurence: *New System of Agriculture*, 1726, p. 92; *The Farmer's Compleat Guide*, 1780, pp. 21-24.
- ¹⁹ *New Experiments*, 1736, p. 6 ff; *Practical Farmer*, 1732, p. 27.
- ²⁰ *Practical Farmer*, p. 17; *Chiltern and Vale Farming*, p. 230.
- ²¹ Young: *County Report*, 1804, p. 23. See also *Northern Tour*, 2nd ed., 1770, pp. 13-19.
- ²² pp. 36, 40 ff.
- ²³ D. Walker: *Hertford*, 1795, pp. 24, 25.
- ²⁴ *County Report*, 1804, p. 55. See also pp. 56-157.
- ²⁵ Richard Bradley: *Complete Body of Husbandry*, 1727, p. 247.
- ²⁶ William Guthrie: *A New Geographical, Historical and Commercial Grammar*, 1771, I, p. 229.
- ²⁷ An 18th Century spelling of Wandsworth.
- ²⁸ Bradley, *op. cit.*, p. 253.
- ²⁹ Peter Foot: *Middlesex*, 1794, p. 20 ff.
- ³⁰ John Middleton: *Report*, 1798. Also ed. of 1807, p. 138, 149, 151, 164, 186, 188, 301, 303.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for November, 1936, are given below, with comparative figures for October, 1936, and November, 1935. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	Nov. 1936	Oct. 1936	Nov. 1935	Nov. 1936	Oct. 1936	Nov. 1935
	d.	d.	d.	d.	d.	d.
Northern	13½	13	13½	3 1/8	3 1/8	3 1/8
North-Western ..	13½	13	13½	3 1/8	3 1/8	3 1/8
Eastern	13½	13½	13½	2 7/8	3 1/8	2 11/8
East Midland .. .	13½	13	13½	3 1/8	3 1/8	3 1/8
West Midland .. .	13½	12½	13	3½	3 11/8	3½
North Wales .. .	13½	12½	13	3½	3½	3½
South Wales .. .	13½	12½	13½	3 1/8	3½	3½
Southern	14	13½	13½	2 11/8	3 1/8	2 11/8
Mid-Western .. .	13½	12½	13	3½	3 11/8	3½
Far-Western .. .	13½	12½	13	3½	3 11/8	3½
South-Eastern ..	14½	13½	14	2½	3 1/8	2½
Unweighted Average ..	13·55	12·91	13·36	3·03	3·63	3·23

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal.

The number of producers who qualified for the accredited premium was 19,625 and the sum required for the payment of the premium was equivalent to a levy of 349d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal. on liquid milk sales, compared with 2d. per gal. in November, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Nov. 1936 (estimated) Gal.	Nov. 1935 Gal.
Liquid	46,508,102	45,594,413
Manufacturing	18,132,585	19,259,058
	<hr/> 64,640,687	<hr/> 64,853,471
Percentage liquid sales	71·95	70·30
Percentage manufacturing sales ..	28·05	29·70

The average realization price of manufacturing milk during November was 5·78d. per gal., compared with 5·79d. per gal. for November, 1935. The quantity of milk manufactured into cheese on farms was 702,329 gal., compared with

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1,836,381 gal. in October, 1936, and 516,502 gal. in November, 1935.

Inquiry into Objections to Amendments. The public inquiry into objections to the amendments to the Milk Marketing Scheme was adjourned on November 26, and the hearing of the special case of producers of Tuberculin Tested milk opened on December 10.

Milk Products Marketing Scheme. The public inquiry into objections to this Scheme opened in London on November 30, and was adjourned to Edinburgh on December 10. The proceedings were resumed in London on December 17.

Potato Marketing Scheme. Riddle Regulations. On November 20, the Potato Marketing Board announced that the minimum riddle of $1\frac{1}{8}$ in. for white varieties which had been in operation since October 1, 1936, was reduced to $1\frac{1}{2}$ in. in conformity with the riddle in operation for all other varieties.

Area under Potatoes in Great Britain. The Board have recently published an interesting booklet showing the acreage, by counties, of each variety of early and maincrop potatoes grown in the years 1934, 1935 and 1936 by registered producers under the Scheme. The booklet also contains a number of sectional maps showing the predominating varieties of potatoes grown in the main producing areas.

The proportion of the total area under second early varieties has fallen from 9.9 per cent. to 6.7 per cent. between 1934 and 1936, while the proportion under maincrop varieties has risen from 75.6 per cent. to 79.1 per cent.; the proportion under first earlies has remained practically unchanged. The most popular maincrop varieties in each year have been Majestic and King Edward VII, which together accounted for 72 per cent. of the maincrop acreage in 1936. The area planted with Majestics has increased from 130,000 acres in 1934 to 149,000 acres in 1936.

The booklet, which is entitled "The Area under Potatoes in Great Britain, Potato Marketing Board, Miscellaneous Publications No. 4," is obtainable from the Board, price 6d. post free.

Pigs and Bacon Marketing Schemes : Bacon Pig Prices for December, 1936. The contract price of the basic pig (Class I, Grade C) for December, 1936, was 12s. 1d. per score,

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compared with 12s. 2d. for November. The cost of the feeding stuffs ration was 9s. 1d. per cwt. as compared with 8s. 9d. for the previous month, while the ascertained price of bacon fell from 93s. 5d. to 90s. 2d. The realization value of offals rose from 8s. 8d. to 9s. 6d. per pig.

Cancellation of 1937 Contracts. The number of pigs contracted to be supplied by pig producers to curers in 1937 was 1,886,000. This number being less than the number (2,200,000) upon which the agreed guaranteed minimum prices were conditional, the Bacon Marketing Board, in the exercise of their right under the contract, have cancelled all contracts entered into for the supply of bacon pigs to bacon curers in 1937.

Foreign bacon allocations have already been fixed for the first six weeks of 1937, and it is not proposed to make any alteration in these arrangements. Thereafter, imports will continue to be regulated provisionally, with due regard to the supply situation, while the position of the Pigs and Bacon Marketing Schemes is under examination. The object of this examination is to devise machinery with a view to avoiding the difficulties which have been experienced in the past and have led to the action taken by the Bacon Marketing Board on the present occasion.

Bacon Import Regulation. The quota, referred to above, for imports from foreign sources has been determined only for the first six weeks of the year, i.e., January 1 to February 11, 1937. The quota is at a rate about 10 per cent. higher than that for the last four months of 1936, or about 3 per cent. lower than the rate that operated with slight variations for the period May, 1936, to August, 1936.

The allocations to individual foreign countries are as follows:—

<i>Country</i>		<i>Allocations January 1 to February 11, 1937 cwt. (a)</i>	<i>Country</i>		<i>Allocations January 1 to February 11, 1937 cwt. (a)</i>
Denmark ..	391,511		U.S.S.R. ..	5,241	
Netherlands ..	58,573		Argentina ..	4,316	
Poland ..	49,016		U.S.A. ..	49,324	
Sweden ..	28,978		Allowance for imports		
Lithuania ..	18,188		from foreign countries		
Estonia ..	4,624		not scheduled to		
Finland ..	2,466		the Bacon (Import		
Latvia ..	4,316		Regulation) Order ..	14,917	

(a) Subject to amendment, in the case of certain individual countries, in respect of overshipments or undershipments in previous periods.

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Consumers' Committees for England and Great Britain : *Appointment of Assistant Secretary.* Mr. R. A. Hill, of the Ministry of Agriculture and Fisheries, has been appointed Assistant Secretary of the Consumers' Committees for England and for Great Britain. Communications for the Committees should be addressed to the Assistant Secretary at 10, Whitehall Place, S.W.1.

Consumers' Committee for Great Britain: Pigs and Bacon Marketing Schemes. The Food Council have submitted a report on Bacon to the President of the Board of Trade. Copies of this report have also been sent to the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, as it expresses the views of the Consumers' Committee for Great Britain on the operation of the Pigs and Bacon Marketing Schemes. The report may be obtained, free of charge, on application to the Secretary, Board of Trade, Great George Street, S.W.1.

The Council find that since the initiation of the Schemes and the regulation of imports, the home production of bacon and hams has substantially increased, and that prices have been steadier. Prices received by pig producers do not appear to have been excessive, and retail prices, while substantially higher than in the slump period, 1931-32, do not seem unreasonable when compared with the average of the five years preceding the Schemes and with other food prices. It is true that bacon is not so plentiful and cheap as in 1931-32, but consumers still have a wide range of prices from which to select, having regard to the various cuts available and to supplies of the cheaper grades of British and Empire bacon. The Council think that demand may perhaps be too much concentrated on one or two favoured cuts and kinds of bacon.

The Council consider that judged by the criterion of steadiness of prices, the control of bacon imports, although made difficult by the uncertainty of home and Empire supplies, has had very satisfactory results on the whole. They consider that greater flexibility should be permitted in the total supply figure, as the rigid observance of a static limit for total consumption allows no room for expansion of demand and involves the risk that a section of the bacon market may be lost and not easily recovered. The Council hope that when it becomes possible to give effect to the policy of a levy-subsidy the import regulation arrangements can be made more elastic. There would then be greater scope for the

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services of the Market Supply Committee in working and advising on the operation of these arrangements and the Committee might be assisted by a Consultative Committee representative of the bacon industry and of all sections of the distribution trade.

The Council consider that the whole price structure of British bacon should be more closely examined. The cost of pig production must be continuously kept under review, and the difference between a fair price to producers and the price paid by consumers analysed. Steps must also be taken to see that consumers derive full benefit from any reduction in the cost of curing which may result from measures of rationalization undertaken by the Bacon Development Board after the end of 1937. For this reason the Council consider it essential that the Development Board should be given powers to investigate the cost of curing in factories.

The Council state that there has been some criticism of the quality of British bacon, but it appears to be agreed that a definite improvement has taken place since the early days of the Schemes. They would like to see the grading of pigs placed in strong and impartial hands and consider it important that the difference in prices between grades should afford a sufficient incentive to the improvement of quality.

While some progress has been made in regard to the adequacy and regularity of the supply of pigs to factories and the closer adherence to contracts, the Council suggest that there is still room for considerable improvement in these respects.

Live Stock Industry Bill. The Bill to give effect to the Government's proposals for the assistance and development of the live-stock industry, was introduced into the House of Commons on December 4. It provides for the establishment of a non-representative Live Stock Commission, which will not only take over the duties of the present Cattle Committee in regard to the administration of subsidy payments to producers of fat cattle, but will have a wide range of functions in relation to the live stock industry as a whole. The Commission will be charged with the duty of keeping generally under review matters relating to the live-stock industry and of advising and assisting Ministers in such matters, and they will have an important part to play in the development of measures designed to bring about increased efficiency in marketing and

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slaughtering. The Bill also provides for the constitution of an Advisory Committee, representative of all interests immediately connected with the industry, for the purpose of advising and assisting the Commission in the discharge of their functions.

It is proposed, in substitution for the existing emergency provisions, that, as a permanent arrangement, sums up to £5 million per annum should be made available for the payment of a subsidy to producers of fat cattle in the United Kingdom of such amounts or at such rates as the situation may from time to time require. The detailed arrangements for the payment of subsidy are not included in the Bill, but it will be possible to adjust subsidy payments so as to give further encouragement to the production of good quality cattle.

It is proposed, as a precautionary measure, to seek general powers to regulate imports of live stock and meat if it appears desirable in the general interest to do so in order to secure the stability of the market for meat in the United Kingdom.

Provisions designed to improve the system of live stock markets in Great Britain are contained in the Bill. It is proposed that, subject to certain exceptions, on and after August 1, 1937, no premises in Great Britain other than premises on which a live-stock market was formerly held at some time during the year ended on November 30, 1936, shall be used for holding a live-stock market unless the premises are approved for the purpose by the Live Stock Commission. The Bill enables the Live Stock Commission to submit to the appropriate Minister the draft of an order for controlling the holding of live-stock markets in any area in Great Britain where the Commission are satisfied that it is expedient that the holding of such markets should be controlled with a view to the promotion of efficiency or economy in the marketing of live stock. Provision is made for consultation with local authorities and other local interests concerned, for the holding of public inquiries, and for the order, if opposed when made by the appropriate Minister, to be provisional only and not to have effect until confirmed by Parliament. Provision may be made in the order for the payment of compensation by the Commission to persons who suffer any loss or damage in respect of their interest in any land used or appropriated for the holding of markets or in respect of their business as auctioneers, and for the assessment

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and recovery of contributions from other market owners and from auctioneers. Provision is also made for the making of by-laws by the Commission regulating such matters as market charges and the holding of live stock auctions.

The Bill makes provision for the initiation of three experiments in central slaughtering and for Exchequer assistance by grant or by loan, up to £250,000 in all, of which not more than £150,000 may be by way of grant, towards the cost of carrying out such experiments. Provision is also made for the payment of compensation by the Commission to interests affected by a slaughterhouse scheme, and for the collection of contributions from the person carrying on the central slaughterhouse and from other interests concerned.

It is proposed that the Live Stock Commission shall be enabled to make and submit schemes, at the request of any substantially representative body in the industry, for the performance and financing of such services as the encouragement of research and education and of co-operation in matters affecting the live stock industry, and the insurance of live stock and the advertising of meat.

The efficiency proposals in the Bill will be financially self-supporting and will, therefore, make no appreciable call upon money which might otherwise be available for the payment of the cattle subsidy.

Scope has been left for producers to organize themselves by a marketing scheme under the Agricultural Marketing Acts, if they so desire.

The Debate on the Second Reading of the Bill will take place after the Christmas recess.

Marking of Imported Cattle. An Order amending the Cattle Industry (Marking of Imported Cattle) Orders came into force on December 21. Whereas the original Orders provided, with certain exceptions, for the marking of imported cattle over six months old, the Amending Order requires the marking at ports or points of entry in Great Britain or Northern Ireland of all imported bovine animals unless they are:—

(a) Bulls which have grown a fifth permanent molar tooth, or

(b) Cows which have grown more than six permanent incisor teeth, or

(c) Registered pedigree cattle.

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Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	1936 April 1 to Nov. 30	1935 April 1 to Nov. 30	Sept. 1, 1934,* to Nov. 28, 1936
Payments	£2,600,930	£2,517,813	£8,483,517
Animals in respect of which payments were made	1,117,405	1,067,318	3,588,016
Average payment per animal	£2 6s. 6d.	£2 7s. 2d.	£2 7s. 3d.
Imported animals marked at ports (Great Britain only)	371,256	294,174	1,151,933†

* Commencement of subsidy payments.

† As from August 6, 1934.

Milk Acts, 1934 and 1936 : *Manufacturing Milk.* Advances made by the Ministry up to December 15, 1936, in respect of manufacturing milk were as follows:—

Section of Act		Period of Manufacture	Gallons	Advances.
	<i>(a) Milk Marketing Board for England and Wales.</i>			
1	In respect of Milk : Manufactured at factories other than the Board's	April, 1934, to July, 1936		£
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	162,699,723	2,139,236
3	Made into cheese on farms ..	April, 1934, to June, 1936	2,573,662	12,850
			36,055,516	187,463
	* Total for England and Wales ..		501,328,901	2,339,549
	<i>(b) Government of Northern Ireland.</i>			
6	In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936		
			60,168,430	359,021
	TOTAL ..		561,497,331	2,698,570

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

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Milk in Schools Scheme. Exchequer contributions up to December 15, 1936, towards the expenses of the Milk Marketing Board for England and Wales in respect of the supply of 44,484,572 gal. of milk to school children at reduced rates during the years October, 1934, to September 1936, amounted to £796,620. 21,632,336 gal. of milk were consumed in the second year of the scheme as compared with 22,852,236 gal. in the first year. Further returns will slightly increase the figures for the second year.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5.98 pence per lb. for the month of December, 1936.

Wheat Act, 1932: Sales of Home-grown Wheat, Cereal Year, 1936-37. Certificates lodged with the Wheat Commission by registered growers during the period August 1, to December 4, 1936, cover sales of 9,142,966 cwt. of millable wheat as compared with 15,237,600 cwt. in the corresponding period (to December 6) in the last cereal year.

Sugar-Beet: Determination of Acreage for 1937 Crop. The Sugar Commission is required by Section 5 (1) of the Sugar Industry (Reorganization) Act, 1936, to determine for each year a maximum acreage in respect of which contracts may be entered into by the Corporation with a view to securing that the quantity of sugar produced by the Corporation in each year from home-grown beet is as nearly as may be equal to 560,000 tons of white sugar. The Commission has accordingly fixed a maximum of 405,000 acres for contracts in respect of the 1937 beet crop. This figure has been provisionally subdivided as follows: English factories 390,000 acres, Cupar factory 15,000 acres.

Production of Home-grown Beet-Sugar during 1936-37 Campaign. According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet-sugar manufactured in Great Britain during November, 1936, and during the corresponding month in 1935, were:—

			White cwt.	Raw cwt.	Total cwt.
1936	1,712,794	1,698,168	3,410,962
1935	1,470,236	1,665,380	3,135,616

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The total quantities of sugar produced to the end of November in each of the two manufacturing campaigns were :—

	<i>White cwt.</i>	<i>Raw cwt.</i>	<i>Total cwt.</i>
Campaign 1936-37	3,135,017	2,857,866	5,992,883
Campaign 1935-36	2,785,948	3,332,151	6,118,099

The Sugar (Rate of Assistance) Order, 1936. In accordance with the provisions of section 14 of the Sugar Industry (Reorganization) Act, 1936, the Minister of Agriculture and Fisheries, with the consent of the Treasury, has made the above-mentioned Order (S.R. & O. 1936 No. 1,307) prescribing a rate of 5s. 3d. in respect of the year starting on April 1, 1936, for the purpose of enabling the effective rates of assistance in respect of sugar manufactured by the British Sugar Corporation, Ltd., from home-grown beet to be calculated. The Order also fixes £240,000 as the minimum sum to be placed by the Corporation to a depreciation reserve during the year and specifies an estimate of 4s. 6d. per cwt. for the average raw-sugar price and an estimate of maximum quota income of £631,728 18s.

National Mark Eggs. Notice has been given in the *London Gazette* of the Minister's intention to make the following amendments to the Agricultural Produce (Grading and Marking) (Eggs) Regulations, 1936, in regard to hen eggs produced in England and Wales. The amendments will take effect on or about January 13.

“ Article 1 and the First Schedule to the Agricultural Produce (Grading and Marking) (Eggs) Regulations, 1936, (hereinafter called the Principal Regulations) shall be read as if there were included therein the grade designations

SPECIAL weight and SPECIAL as alternatives to the grade designations New Laid SPECIAL weight or New Laid SPECIAL

STANDARD weight and STANDARD as alternatives to the grade designations New Laid STANDARD weight or New Laid STANDARD

MEDIUM weight and MEDIUM as alternatives to the grade designations New Laid MEDIUM weight or New Laid MEDIUM

PULLET weight and PULLET as alternatives to the grade designations New Laid PULLET weight or New Laid PULLET
and the Principal Regulations shall have effect accordingly.”

National Mark Publicity. During the March quarter of 1937, National Mark Exhibitions and “ Weeks ” will be held in Norwich (February 10-20) and Ipswich (March 10-20).

At the British Industries Fair, to be held at Olympia from February 15-26, the Ministry will stage a comprehensive display of National Mark products. Sample products and a full range of the Ministry's publications will be on sale.

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THE Forty-Seventh Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on Thursday, December 10, 1936, *Alderman G. E. Hewitt* in the Chair. *The Minister, the Rt. Hon. W. S. Morrison, M.C., K.C., M.P.; the Parliamentary Secretary, the Earl of Feversham; and the Permanent Secretary, Mr. Donald Fergusson, C.B.,* attended on behalf of the Ministry.

McCreagh Estate. *Mr. H. W. Thomas* (Hants) asked whether the Ministry had been able to do anything with regard to the derelict estate in Hampshire. *Mr. George Dallas*, in reply, said that the matter was still before the Standing Committee and that the Committee would take an early opportunity of raising the question with the Ministry on behalf of the Council.

Agricultural Education and Farm Institutes. *Mr. W. R. Smith* moved the adoption of the Report by the Standing Committee on Agricultural Education and Farm Institutes (see Appendix I, page 969). The Report was adopted.

Rural Housing. *Lord Cranworth* (East Suffolk) moved the adoption of the Standing Committee's Report on Rural Housing (see Appendix II, page 971).

Lt.-Col. G. H. Long, O.B.E., said that in West Suffolk the Council had been overwhelmed with applications in respect of housing in rural districts. In one district, with 20 small parishes, a survey had been made, with the result that 153 cottages were condemned as unfit for human habitation. One of these cottages was on land which he was farming and was rather typical. It had three rooms, two of which were bedrooms, one just big enough to get a double bed in, and the other was only 6 ft. by 4 ft. The District Council were proposing to build new houses for the men turned out. He thought that bad housing in rural districts was a more serious deterrent to a sufficient supply of labour for the land than were low wages. *Mr. G. Craven* (Holland) was in favour of the Report because the reconditioning and re-building which was going on under Demolition Orders were not providing the additional houses required. In his own parish, there were over 100 applicants for houses, many being young people intending to marry.

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Mr. T. Lovell, Mr. W. Holmes and Mr. A. Pearce also spoke in favour of the Report. *Mr. C. H. Roberts* (Cumberland) said that the Council should be clear on what was really wanted. Under existing powers, houses were being condemned, or reconditioned, or built anew, given an energetic County Council and a District Council that knew its job. But when all was done, there was still a shortage of rural houses, and what was wanted was a subsidy for new houses so that agricultural workers could be properly housed. *Alderman W. H. Turner* (West Riding) said he thought the figure of £800-£1,000 a pair for new cottages rather high. *Mr. George Dallas* said good housing was essential if agriculture was to be helped by keeping on the land men and women of the right type, and all authorities, national and local, should do everything possible to amend the situation. *Mr. Cecil Robinson* (Holland) said that if he had his way he would do without subsidies, trusting to tariffs and quotas. Agriculture should be placed on a sound footing so that millions more pounds worth of agricultural produce might be grown. This would allow the farmer to pay labour a better wage and so enable the labourer to pay an economic rent. *Major R. G. Proby* (Hunts) said that if subsidies were granted he hoped that they would be available to private landowners as well as public authorities. Landowners would see to it that the tenant got the benefit. *Mr. W. R. Smith* referred to a newspaper report of a Rural District Council Meeting at which the Chairman had said that so many houses were dilapidated that people living in them had to sleep downstairs, and that the buildings were in danger of collapsing at any moment. It was important to keep on the land those men and women who by instinct and tradition, and by daily contact, were highly-skilled agricultural workers. It could not be done without a strong national policy towards proper housing. *Mr. Donald Fergusson*, on behalf of the Ministry, said that the Ministry would have pleasure in forwarding the Report of the Standing Committee, if passed by the Council, to the Sub-Committee of the Ministry of Health which was considering the whole matter of rural housing. In winding up the debate, *Lord Cranworth* said that the tied cottage was not referred to in the Report because it was a controversial question. He did not, however, think it controversial to say that the landlord who does not keep his tied cottage in a good state of repair is not only wrong but very foolish. As regards the suggestion that had been made

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that the figure of £800-£1,000 for a pair of cottages was rather high, he called attention to the sentence in the Report which made it clear that an essential need was to ensure that cottages shall be more commodious and comfortable than had been considered as suitable in the past. The Report was put to the Meeting and adopted.

The Minister's Address. *The Chairman* welcomed the Minister to the first Meeting of the Council held since the Minister came into office. In the course of his address, which dealt mainly with the broad outlines of the Government's agricultural policy, *the Minister* said that he would do his very best to see that agriculture was maintained in its proper position amongst the activities and industries of the country. Farming was an industry in which long-range views were essential not only on the part of Ministers, but on the part of those who work on the land. Consequently, what is required above all things is that the policy should have permanence and continuity so that people shall know where they are and what they can expect in the years lying ahead. The Minister then referred to the great services that his predecessor in office had rendered to British agriculture, and said that his own appointment did not mean any breach in continuity of policy. In the course of his duties as Financial Secretary to the Treasury, he had had to express the views of H.M. Government at Geneva on the subject of world trade, and had then to deal with other countries' restrictions on trade made with the object of keeping up an unsatisfactory currency position. This country had no such currency difficulties. Our quotas and tariffs, insofar as they affected agriculture, were imposed for the assistance of the industry and to maintain our vital needs. He wanted to make that point clear because it had been wrongly said that he was a "Free Trader." He believed that agriculture to-day must continue to receive protection and assistance in order to secure to our own people a sufficient supply of food at reasonable prices with a prospect of reasonable remuneration not only to home farmers, but to farm labourers. The Minister then briefly sketched the position in regard to the chief agricultural commodities—meat, wheat, sugar, milk, pigs, bacon, hops and potatoes. Prices of agricultural commodities, taken as a whole, in October and November of this year, and taking the subsidies into account, were back to the 1930 level and were 23 per cent. above the

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low level of 1932. Protection had raised agricultural production in 1934-35, when it was 19.7 per cent. higher than in 1930-31.

As regards the Live-Stock Industry Bill, he had read the Report of the Standing Committee, which showed what in his view was so valuable, namely, really constructive thought on the subject. It was very usual for a Minister to receive much negative criticism, but it was a great help when constructive proposals were made. The Report called for a general grading up of live stock, for improved marketing intelligence, and the need for a regulated market for live stock and meat. These points were being met in the Bill now before Parliament. The proposals in the Bill were to set up a Permanent Commission for live stock, which would be a body able to negotiate in the producers' interests with Local Authorities on the various matters which would arise under the Bill. Thus the reorganization of the industry, and the administration of the £5 million subsidy proposed under the Bill, would be entrusted to this Permanent Commission, which he hoped would have the confidence of the agricultural industry. The Minister then gave an outline of the Bill, remarking upon the purpose of each Part in turn. In passing, he reminded the Council that permanence in policy could only be achieved by the goodwill of the whole people, and that it was one of the most hopeful signs of recent years that there had been a change of public opinion in the direction of sympathy with agriculture. We had, he said, to convince the public that we were dealing with our trust—the land—in a way which was for the benefit of the whole country. Given that and genuineness of support, and he was sure that the prospects of the industry were good.

Lord Eltisley, K.B.E. (Cambs), moved a hearty vote of thanks to the Minister for his address. The Council was at one with the Minister in its anxiety to see the greatest possible production of good foodstuffs secured from the land of the country. A strong and vigorous agricultural policy was vitally necessary, and the chief purpose of the Council was to further and assist any action in the direction of attaining it.

Mr. George Dallas seconded the vote of thanks, welcoming also the Earl of Feversham and Mr. Donald Fergusson. He added that the Council represented every interest in agriculture, and he thought that the Minister could always count

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on its loyal help and support. As to the Ministry, it should be put on as high a level as any other Department of State. The vote was carried with acclamation.

Rabbit Problem. *Lt.-Col. Sir Merrik Burrell, Bart., C.B.E.* (West Sussex), moved the adoption of the Standing Committee's Report on the Rabbit Problem (see Appendix III, page 973). He proposed certain small alterations which were adopted. One of these dealt with the use of steel traps, which Sir Merrik pointed out were used not only to catch rabbits, but other vermin, e.g., the grey tree rat. He suggested that the Report, if adopted, should be sent to the Clerk of the Select Committee of the House of Lords.

Mr. W. Hearle (Cornwall) thanked the Committee for the Report, though he said it did not carry the Council much further. In relation to grading the rabbits, he added that English rabbits were quite frequently graded. They were not graded when they were sent through the hands of the small dealer. He did not agree with the last clause, because, when land was once cleared, rabbits came in from outside, and it was soon as bad as it had been before. In some respects this country was still a dumping ground for surplus products, though he was encouraged by the frequent repetition of the promise to give English farmers the first place in the British market.

The Report, as amended by Sir Merrik Burrell, was adopted.

Liming of Land. *Mr. C. C. Smith* (East Suffolk) moved the adoption of the Standing Committee's Report on the Liming of Land (see Appendix IV, page 974), in which he said that the word "lime" was meant to refer to all approved sorts of lime. The Report was adopted without debate.

Tuberculin Test for Imported Cattle. *Professor A. W. Ashby, M.A.*, moved the adoption of the Standing Committee's Report on the Question of the Tuberculin Test for Imported Cattle (see Appendix V, page 975). *Mr. D. G. Watkins* (Hereford) said that he was disappointed that a way could not be found of putting Irish cattle under the same conditions as Canadian. He thought it a disgrace seeing old cows from Ireland being sold in our markets from 7s. 6d. up to £5. He asked whether we were doing our best to provide purity and quality by allowing these cattle to come in, knowing that a

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big percentage were tuberculous and not subject to a single test. He would not ask for the double test. *Lord Cranworth* said that as a member of the Standing Committee he disagreed with the Report, and he was sorry to be at variance with the majority of the Committee. He maintained that it was a reproach to British agriculture to have so large a percentage of tuberculous cattle, and to endeavour to remove that reproach the Government had used moral persuasion and local sanction, and were spending public money to induce people to clean up their herds, but they were making practically no advance except in a few limited territories, mostly in Scotland. It was inconsistent with this policy to admit every year 350,000 animals without test, and conditions in Ireland may be worse than they are in this country. He admitted that a false sense of immunity might follow if these animals were tested, because many of them would be reinfected again, but the making of the test would prevent, at least, numbers of animals coming to this country which were known to be infected, and would show the public that it was not only lip service being given to the doctrine of eradicating the disease. *Sir Merrik Burrell* said that no one was more anxious to see the eradication of tuberculosis from herds than he was. The incidence of the disease in our own cattle was something like 40 per cent., and the greater part of it amongst the older cows. The cattle coming from Ireland were not old cows, they were chiefly young bulls and heifers, and the incidence in the cows would, he thought, be much less than 40 per cent. If we were to insist that all animals had to be tested before they were sold on the market, he could not see how that could be supported in argument with the Irish Governments, especially when home-bred cattle were not to be likewise tested. Cattle tested once could not be given a certificate as safe cattle. They would, in fact, have a false certificate which would give people buying them a feeling of security they had no right to have. It was not difficult to enforce certification for the comparatively few cattle coming from Canada, but it would be impossible in the case of those coming from Ireland. They would have to be held some little time at the lairages, which might become infected and spread the disease. He therefore disagreed with the two previous speakers. *Mr. Watkins* then proposed that the Report be again referred back, and that pregnant cows and cows in milk should be subject to a test.

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Mr. A. Matthews (Hereford) seconded that proposition. *Professor Ashby* said that he thought *Mr. Watkins* was rather confusing two things. There was in his mind the question of a clinical examination of cows, especially old cows, which might disclose the existence of tuberculosis. On that point there could not possibly be any difference between him and any member of the Council or Standing Committee. The Committee would certainly agree that, in any case, where tubercular infection was discovered by clinical examination the animals ought to be excluded. There was, however, a different problem with the 300,000 or so maiden heifers coming from Ireland. A test would have to be made in Ireland, and who could rely upon decisions made on this vast number of cattle scattered up and down the farms of Ireland. There was another point, that, if such a test could be carried out and the heifers later imported on the certificate, there would be a premium placed on their value far in excess of any to which they had a right. When the country was ready for a general attack on the problem of bovine tuberculosis, then a test on all imported cattle could be required. The most practical work being done to-day in the direction of achieving freedom from the disease was in trying to discover areas which are relatively free, cleaning them up absolutely and keeping them free. There were two such districts in Wales, and in a year or two it would be possible to supply from them heifers guaranteed free from disease. When districts were cleaned, Irish or any other untested cattle would be excluded from them. He asked the Council to accept the Report with a rider to the Committee to pursue the consideration of the most practical methods of obtaining freedom of the herds of the country from tuberculosis. *Mr. Watkins* and his *seconder* agreed, and the Report was adopted.

Live-Stock Industry Bill. *Mr. George Dallas* proposed the adoption of the Standing Committee's Report on this Bill (see Appendix VI, page 977). *Mr. H. W. Thomas* asked whether the standard price referred to in the White Paper, 1934, could not be given.

Major R. G. Proby discussed the fundamental principles of cattle feeding in this country, and said that, if extensive cake-feeding could be supplanted by concentrated, home-grown food in a cheaper form, e.g., grass or root cake, the farmer would be better able to compete with the foreign producer.

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If a farmer could convert his cheaper products into cake, his industry would be more self-contained. Much experimental work had been done along that line, and he thought success might be achieved. He commended this line of inquiry to the Ministry of Agriculture. *Mr. J. O. Adams* (Northants) said that many more cattle should be reared in this country.

Sir Merrik Burrell, in reply, said that the subject of Major Proby's suggestion was under consideration by the Agricultural Research Council; one Report had been issued and another was coming forward. *Mr. George Dallas* gave Major Proby an undertaking that the Standing Committee would also look into the matter, as well as into the question of cattle rearing raised by Mr. Adams. *Lord Feversham* added that the question of importing feeding stuffs as an alternative to the importation of the actual product, beef, into the country, was a matter which was being very carefully considered both by the Committee of Imperial Defence and by the Food Defence Plans Department under Mr. French. The Report was then adopted.

Cottages at Aerodromes. *Sir Merrik Burrell*, on behalf of the Standing Committee, moved the following resolution :

" That the Council of Agriculture for England calls the attention of the Minister for Air to the fact that in the extension of old, and the establishment of new, aerodromes, the cottages which are being erected are frequently of a design and materials completely out of harmony with the architecture of the locality ; and that, in view of the efforts being made now by Local Authorities to preserve the natural beauties of the rural areas of the United Kingdom, the Minister for Air shall be urged to give instructions that, in future, County Councils shall be consulted as to the external design of such cottages and their acquiescence obtained before construction takes place."

It was seconded by *Brig.-Gen. H. Clifton Brown, M.P.* (West Sussex), and carried.

Travelling, Subsistence, etc. Expenses to County Agricultural Committee Members. *Mr. John Beard* moved the following resolution :—

" That this Council of Agriculture calls the attention of the Government to the difficulty of securing Labour representatives on many County Agricultural Committees owing to County Councils declining to make financial provision to meet the needs of the labourers for travelling, subsistence, and loss of pay ; and asks the Government to remedy this defect in the Act, either by itself or through instructions to County Councils to make such financial provision as will make it possible for labourers to give their quota of service."

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He said that, if the Government really wanted working labourers on the Committees, County Councils should see that the chosen men suffered no financial loss. Some County Councils already paid expenses; there should be a movement to bring the backward ones into line. *Professor Ashby* seconded the resolution. He added that it had been agreed in setting up County Agricultural Committees that every Committee should have the same kind of constitution as this Council, which had never been weakened in its Labour representation. The Ministry of Agriculture might consider how much it would cost them to contribute to the expenses of the Agricultural Committees in the ratio of 60 per cent. of its expenditure for this purpose. He thought that every County Council would come into line if an offer of this sort were made. The motion was put to the Council and carried.

Voting for Marketing Board Members. *Mr. F. Sole* (Isle of Ely) moved the following resolution:—

“That the Council of Agriculture for England considers that, in the interests of Registered Producers under the various Marketing Schemes, a simplified method of voting for the election of members of the Boards is highly desirable.”

He sketched the practice to-day which resulted in forms being issued to people who did not know who were being put up for membership of Boards. Small-holders had no knowledge of proxies, and there were hundreds of thousands of producers who did not vote. The present method rather tended to overload the Board with nominations from the National Farmers' Union. Nominations should be made by registered producers in every case. *Alderman J. W. Payne* (Isle of Ely) seconded the resolution. *Mr. Fergusson*, on behalf of the Ministry, said that it was generally acknowledged that the arrangements made for voting were capable of improvement, and the matter was being considered by the Marketing Board Co-ordination Committee and a Sub-Committee of the National Farmers' Union. He thought it would be appropriate if a copy of this motion were sent to those bodies, as they were the proper authorities to make the changes. The motion was put to the Council and carried.

Balance of Agriculture. *Capt. W. G. Coates* (Leicester) moved the following resolution:—

“That the Council of Agriculture for England desires to draw the attention of H.M. Government to the fact that there is more apprehension amongst those engaged in Agriculture to-day concerning the Government's Agricultural Policy than at any time since they came

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into office. The Council therefore requests H.M. Government to take immediate steps to restore the balance of Agriculture, so as to enable it to produce at least 60 per cent. of those essential foodstuffs required in time of war."

He said that when the Government came into office the index figure for the price of fat cattle stood at 126 without any subsidy. Five years later it was 109, and with regard to store cattle, too, there had been a drop. Bacon figures had dropped from 121 to 114, whilst milk had finished at 171, though he gathered that this index figure was not that of the price which the producer got for milk on the farm. In earlier days, it was true to say that we literally commanded the seas; to-day, other countries had as strong navies as our own and the submarine position entirely altered the situation. As regards the balance of agriculture, the Government's economic policy had made the British farmer rely more and more on imported feeding stuffs. Twenty per cent. of the cost of milk was in feeding stuffs, and he suggested that, in view of the unstable conditions abroad, it would be wise to grow sufficient food for the people within the country; not sufficient for only three days a week, but for four at least. He did not necessarily fix it at 60 per cent. for each of the essential commodities, but he would like to see some such figure aimed at, so as to give a balanced ration for the people from our own soil.

Mr. A. L. Adkinson (Warwick) seconded. *Mr. A. E. Bryant* (Bucks) asked what the Committee on Food Supply in Time of War had done. There was plenty of land for growing increased food and there were men idle to-day. Why should they be paid the Dole in preference to setting them to work on the land—the foreigner worked full-time, producing food for us. Formerly, there were 40 labourers in his village helping to grow food for the people; to-day there were 5. *Mr. J. P. Terry* (Gloucester) asked for a quick remedy for the tremendous slump in certain prices, particularly those of beef.

The Minister of Agriculture said he was not going to enter at great length into the problems raised, and he was not going to hold Captain Coates to the 60 per cent. named, because he was sure that in Captain Coates' mind the figure was merely an indication of the increase which was desired. He would, however, give the Council a figure or two showing what it would mean to increase our output to 60 per cent. It would mean an increase of 157 per cent. in the wheat acreage;

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100 per cent. increase in the area under sugar; and 61 per cent. more milk. As to the balance of agriculture, he had heard the expression used with different meanings. In his mind there were two prominent factors in agriculture, namely, soil and climate. The balance of agriculture was the balance with relation to those two permanent factors; nobody could change them, except that you can add a little to the fertility of the soil. He, also, would like to see the greatest possible production of food in this Island, but he would like to see it done in conformity with the soil and climate, because, though it might be necessary to stimulate this or that particular branch of the industry for a particular purpose, the edifice had to be built upon a rock and that rock was the two factors named. What was in the Government's mind was to restore prosperity to all branches of agriculture so that the land might be developed along natural lines and produce the greatest amount of food that can be so produced. He was aware of the depression in the live-stock industry and of its bad repercussion on other branches. He had said what the policy was and expected it to be criticized because the £5 million would not be large enough. He would ask members not to criticize it with relation to prices as they were at the moment. This was the seasonal period for a flush of cattle in the markets, and the low prices would not be permanent. The tide was showing signs of turning, and in the subsidy a great number of producers would receive an extra reward for quality. He asked the Council to bear in mind the desirability of permanence of agricultural policy, the possibility of getting the most out of the land, and the fact that the Government were determined to develop agricultural policy on sound lines, so as to improve the return to agriculture of all those who were in it. *Captain Coates* asked permission of the Council to withdraw the figure of 60 per cent. The resolution was put to the Council and agreed, subject to the omission of the figure.

Diversion of Surplus Foods to Unemployed, etc. *Major Nelson Rooke* moved the following resolution:—

"That the Council of Agriculture for England is of the opinion that the Government should be asked to take immediate steps to ensure that any so-called 'surpluses,' i.e., amounts of agricultural produce grown in excess of ordinary requirements, shall be diverted, without loss to the producer, to any needy section of the population, such as those in receipt of National Health Insurance, Unemployment Relief, or other form of public assistance, as, in the interests of food production

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against an emergency, of proper nutrition for the under-fed, and of the agricultural industry itself, it is essential to stimulate production in this country."

He said that the Minister had shown how the land could be kept up and the fullest production obtained from it. From the point of view of the consumers' health, it was important for them to get as much fresh, home-grown food as possible. From the point of view of safety, which had been stressed not only by Captain Coates, but by Sir Merrik Burrell, it was likewise important. On the other hand, potato acreages were being restricted by the Potato Marketing Board. That seemed a pity when large sections of the population needed potatoes. He was aware of the experiment in providing surplus potatoes to a Distressed Area in 1935 and thought it worth repeating. Again as regards milk, too much milk went into manufacture, and better administration should give the producer a better price and the consumer more in quantity, so that no one would lose. In the Rhondda Valley, milk was sold at 1s. 4d. instead of 2s., and given to nursing mothers and young children. His proposal was that certain kinds of foods should be made available to certain classes of people on vouchers, the vouchers being based as to price upon the manufacturing or wholesale price. The recipients would have to come forward with their own jars and utensils when they used the vouchers. He thought there could be no better time than the present to stimulate a scheme of this kind. The resolution was duly seconded, and the suggestion made that it should be referred to the Standing Committee. *Major Rooke* agreed to that course, which was put to the Meeting and carried. The resolution accordingly stood referred to the Standing Committee for consideration and report.

APPENDIX I

Report from the Standing Committee: Agricultural Education and County Farm Institutes

1. The Standing Committee has from time to time given attention to the question of the provision of suitable education for young people who propose to take up farming as a career. The Committee has visualized such education as that which should be given from the time when rural children leave the country school to the time when they are old enough (i) to take on the management of a small farm holding, or (ii), in the case of those who propose to become agricultural workers, to perform satisfactorily the better-paid and more highly-skilled tasks on the farm. In exploring this ground, it has come to light that the facilities existing for this kind of education for such young people are comparatively few, and, what there are, are supplied as regards (i) by the teaching given at County

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Farm Institutes and similar institutions, nearly all of which are helped by substantial grants from public funds; and, as regards (ii), by organized classes held in the villages or country towns of certain of the more forward counties. This Report, however, is intended to deal in the main with (i) above and we may think it advisable to recur to (ii) in a later Report.

2. In the following statement are given a list of the existing Farm Institutes, etc., and, in brackets after the name, the approximate number of students each is capable of taking, or will be capable of taking, when certain proposed extensions are completed. The number of students actually receiving education at these institutes is in nearly all cases up to the limit of capacity, and, in some instances, even beyond it, some few students living outside the institutes.

<i>Counties</i>	<i>Farm Institutes, etc.</i>
Cheshire	Reaseheath .. (78)
Cumberland and Westmorland ..	Newton Rigg .. (18)
Durham (Northumberland) ..	Houghall* .. (60)
Essex	Chelmsford .. (60)
Hants (Isle of Wight)	Sparsholt .. (53)
Herts (Middlesex)	Oaklands .. (40)
Kent	Borden .. (40)
Lancs	Hutton .. (60)
Northants	Moulton .. (30)
Somerset	Cannington .. (50)
Staffs (Warwick and Salop) ..	Rodbaston .. (30)
Suffolk, West (Suffolk, East) ..	Chadacre .. (45) (Non-County)
Sussex, East	Plumpton .. (40)
Worcs	Avoncroft, ..
	Bromsgrove (30) (Non-County)
Yorks	Askham Bryan* (60)

* In course of erection.

3. In addition, arrangements have been made with three agricultural colleges to take students for shorter courses than are usual with them so that they may be able to give education of the same type as that given at farm institutes. The latest available figures of the numbers so accommodated are as follows:—

<i>Counties</i>	<i>Colleges</i>
Devon and Cornwall .. ..	.. Seale-Hayne (28)
Derby; Notts	} Midland Agricultural .. (60) College
Leicester; Rutland	
Lincs (Lindsey)	
Lincs (Kesteven)	
Lincs (Holland)	
Gloucester; Wilts .. ..	.. Royal Agricultural College, (20) Cirencester.

4. The counties without any farm institute facilities are Hereford, Norfolk, Isle of Ely, Cambridge, Hunts, Beds, Bucks, Oxford, Berks, Surrey, West Sussex and Dorset.

5. It appears to the Committee that, with the growing return of prosperity to the agricultural industry, the need for farm institute education is likely to increase far beyond the present supply. The smallness of the existing provision can best be realized by reference to the number of holdings of 150 acres or less in the district of any farm institute. The West Midland area (Staffs, Warwick, and Salop), for instance, considered as being served by the Rodbaston Institute with about 30 places, shows that there is one place for about every 770 holdings; and in Yorkshire when the Askham Bryan Farm Institute has been completed there will be one student place for every 550 holdings. The same figure obtains

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for Cumberland and Westmorland with the Newton Rigg Farm School. In some of the Southern districts the provision is rather greater, e.g., in Somerset, with Cannington Farm Institute, it is 1 for 225 holdings, and Essex 1 for 110. Again, according to the above data, the Royal Agricultural College, Cirencester, provides one short-course student place for 600 holdings in the district which it serves, whilst Seale-Hayne College has one for every 540. For the counties named in paragraph 4 there is no provision of the kind at all.

6. The Committee submits that this condition of affairs is unsatisfactory and should be remedied; and it suggests to the Council that Council members might very usefully give careful consideration to the position in their own counties, and, if they think it desirable on the facts as they find them, should propose to their County Committees and Councils that those bodies, too, should reconsider the matter with a view to securing an improvement in the position. If it is found in any county in which there are no existing facilities that it is impracticable to provide them on a county basis, then it is suggested that the possibility of combining with any adjoining counties similarly placed might be explored.

7. Furthermore, as this type of agricultural education is usually put under the management of the County Agricultural Organizer, we consider that the provision of farm institute facilities for the training of young farmers should not be allowed to diminish the very valuable aid given to farmers and the industry by the Agricultural Organizer and his staff through direct and indirect contact.

8. The Standing Committee is aware that much good foundation work for agricultural education is being done in many parts of the country through the medium of Young Farmers' Clubs. These clubs, considered as a means of practical training for young farmers and young agricultural workers, should be generally encouraged. In particular, with the latter class, do we think that there is scope for the club movement to give great help, both to the young workers themselves and to the agricultural industry, by encouraging them to study the simple scientific facts which underlie sound farming technique. There is also the Ministry of Agriculture's scheme of scholarships for the sons and daughters of agricultural labourers and others, which has helped to put many rural youths on the path which leads to efficiency in the industry. In the past ten years, about 900 scholarships have been given tenable at farm institutes by means of this scheme.

9. If any reinforcement of the plea for more farm institute facilities is needed, it can be found in a consideration of the position in Denmark. There, it is estimated that about one-third of the farmers on small and middle-sized holdings pass through the agricultural schools, which are somewhat of our farm institute type. The State contribution to the expenses and upkeep of the schools is not very heavy, and certainly not in anything like the proportion paid in this country (60 per cent.). Nevertheless, some 2,500 male students pass through these Danish schools annually, as against about 800 all told if all students stayed a year in the farm institutes, etc., in England.

APPENDIX II

Report from the Standing Committee: Rural Housing

1. At the last meeting of the Council, a Report was presented setting out the legislative position in regard to housing in rural districts. A resolution by Alderman E. G. Gooch, as follows:—

“That the Council of Agriculture for England, being convinced that agricultural prosperity cannot be brought about until the social

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needs of the workers, particularly in relation to housing, are fully met, urges the Government to renew the subsidies, without which it is impossible to build rural cottages at rents which farm workers can afford "

was also moved and seconded at the last Council meeting and was referred to the Standing Committee for consideration and report.

2. The Standing Committee has accordingly given further consideration to the whole subject, and, having reviewed the facts available to it, finds itself in agreement with the terms of the resolution referred to it. The Committee is, in fact, fully persuaded that urgent steps are required to be taken in many parts of the country if the agricultural industry is to be adequately served in the matter of houses for agricultural workers.

3. The various enactments to which attention was called in the last Report are of undoubted value in those counties where the task of improving the rural housing situation is being taken up with enthusiasm—not a large number at the present time. There are still many districts in which the young people of the villages are unable to find homes therein, although they wish to continue to get their livelihood on or by the land. Many who may wish to marry and settle down in farm or other rural employment are driven away, first perhaps to a neighbouring town, from which they precariously find means of transport to and from their work, and, later, drift away and seek employment in the cities.

4. We have heard of one district where there is a demand for at least 1,000 new cottages for rural workers in connection with a new development there of the local agricultural industry, and where, when a house has become vacant, there have been as many as 40 applicants for it. This case is probably very exceptional, but we think there are many districts up and down the country where conditions, though less acute, are similar.

5. The importance of a wise employment of the powers of reconditioning rural cottages should not be overlooked by local authorities and owners. These powers provide a supplementary means of meeting a local shortage, though care must be taken to be sure that the houses proposed to be reconditioned are good enough for it.

6. The Committee is aware that the whole subject is now under consideration by a Rural Housing Sub-Committee of the Central Housing Advisory Committee at the Ministry of Health. We look forward to the issue of a report by that Committee with great interest, but in the meantime cannot refrain from venturing to advise the Council that the position over the country is serious, and that nothing short of a wide scheme of assistance by way of subsidy seems likely to be sufficient to improve the position appreciably.

7. It will be within the Council's recollection that various subsidy schemes have been operated since the War, and that the successful ones, so far as the agricultural industry is concerned, have been those where the subsidy was sufficient to make it possible for the local authority to let the cottages at rents which agricultural labourers could afford to pay. These may be reckoned at from 3s. to 4s. a week. It is obvious that, since good cottages cannot be built, except in some specially favoured districts, for less than £800 to £1,000 a pair, an economic rent per cottage based on the capital outlay would be much more than 3s. to 4s. a week.

8. It is suggested that if and when the Government decides upon a subsidy scheme for rural housing, the first step thereafter should be the compilation of a schedule of the districts in which the shortage of agricultural cottages is acute.

9. The Committee considers that it would also be desirable, in working a general subsidy scheme, that besides having regard to the special needs as to suitable cottage designs for each district—an object on the importance

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of which all authorities will agree—special attention should be given to the group-planning of cottages and their being placed at convenient situations so that facilities in respect of water, electric light and heat, may be more efficiently and cheaply supplied. The essential need, however, in any subsidy scheme for agricultural workers' cottages is to ensure that the cottages shall be more commodious and comfortable than have sometimes been considered as suitable in the past, and that they shall be so managed as to make it impossible for them to be tenanted by other families than those whose supporters are, or have been, *bona fide* agricultural workers.

APPENDIX III

Report from the Standing Committee on the Rabbit Problem

1. At the last meeting of the Council (June 19, 1936), Mr. W. Hearle (Cornwall) moved the following resolution :—

“That in view of the fact that wild rabbits have increased to such an extent within recent years as to have become a pest in many parts of the country, the Council urges the Government to prohibit the importation of rabbits for food. It considers that the establishment for a period of a better market for rabbit flesh for food would be likely to cause a rapid diminution in the numbers of wild rabbits.”

The resolution was referred to the Standing Committee for consideration and report.

2. Since the meeting, the Committee has taken occasion to examine the subject from several angles, and dealing first with that in the resolution, it finds that the average annual importation of rabbits in recent years is about 400,000 cwt., of which about 90 per cent. are frozen and come from the Dominions, Australia itself supplying about 90 per cent. of the total frozen supply. Of the remainder, i.e., fresh rabbits, more than a half come from Belgium, and the other exporting countries in order of importance are the Irish Free State, Sweden, Holland and Italy. It should be mentioned that the figures of importation of frozen rabbits ran very high during the period 1932–34, then averaging over 500,000 cwt., though since 1934 these have dropped back to about half that figure. The importation for 1935 was 246,190 cwt. frozen and 24,910 cwt. fresh. The corresponding figures for the first ten months of 1936 were 149,827 cwt. frozen and 42,578 cwt. fresh. It will be seen from these figures that while the importation of frozen rabbits is rapidly declining, that of fresh rabbits is on the increase.

3. As against this importation, the estimate of marketed home production, as obtained from information available as to the numbers of rabbit pelts marketed, amounts to about 1,000,000 cwt. For the most part, these home supplies are presented on the market ungraded and in small lots and do not therefore always command the price they should. They do not, of course, compare with certain grades of imported fresh rabbits, e.g., Ostend and other kinds, which are specially produced to meet a high-class trade on our market. The large supply of frozen rabbits are also well graded and are able to be handled so as to be held in cold store and put on the market only when there is a demand for cheap meat of the kind. They find a ready sale at a low price in London and other large cities and towns when they are required to supply a shortage of cheaper meats or of English wild rabbits.

4. Considering the position as a whole, therefore, it is not clear that if increased supplies of home-killed rabbits were brought upon the market

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in their present ungraded state the public would readily purchase them in place of the regulated and graded supplies from abroad, (i) of fresh rabbits, Ostend, etc. ; (ii) of frozen rabbits. The Committee, therefore, is not prepared to advocate the prohibition of imports as suggested in the resolution. The position would be different if wild rabbits were, to any considerable extent, produced or "farmed" in this country on commercial lines and marketed in graded qualities, and the trade well organized and backed by an efficient system of cold storage. As it is, the Committee considers that where the rabbit is a definite pest, farmers should treat it as such, and get rid of it without any incentive of a better market price.

5. As regards methods of destruction, the Committee has considered these from the point of view of effectiveness, and of acceptability to the farming community. Gassing of rabbits on such sites as are suitable for the operation may be the most effective, but apart from the question of whether the meat would be unfit for human food, we question whether farmers would ever be likely to prefer it to the other and more usual methods. The best of these appear to be long-netting, snaring, and ferreting and shooting, though it should be noted that the value of shot rabbits on the market is usually less than of those taken by other means. Whatever the method, or methods, adopted, however, the Committee considers that if they can be carried out as a regular routine on every farm as soon as too many rabbits are in evidence, there would be little likelihood of much further trouble.

6. As regards the general question of rabbit destruction, the Standing Committee understands that this is under consideration by a Committee of the House of Lords, and does not feel called upon to go into it in detail in this Report. Speaking generally, however, the Committee would observe that it is probably undesirable to do anything that would prevent an occupier of land keeping up his rabbits if he wishes to do so where they are not a nuisance to others. There are many districts where the rabbit is not a pest, and others where very large numbers are bred and annually reduced to reasonable bounds by trapping, to the financial benefit of the owners. A point as to steel traps; the Committee would like to see it made illegal for steel traps to be set anywhere except underground or under cover, by anyone.

7. The Rabbits Bill, 1930, proposed that County Councils should be given powers to enter on land and reduce the numbers of rabbits where they were causing or likely to cause damage to adjoining properties, in cases where the owner did not himself carry out the work when asked to do so by the Council. The Committee considers that an Act on these lines would undoubtedly be useful, though great care would have to be taken in exercising the powers so as to avoid damage to game and game coverts.

APPENDIX IV

Report from the Standing Committee on the Liming of Land

1. The attention of the Standing Committee has been drawn to the fact that the periodic liming of land is not now being carried out in many parts of the country where the soils require it in order to help them to produce the maximum crops of which the land is capable. The same general complaint appears to have been made about twelve years ago to the Ministry of Agriculture, which then put forward a scheme for assisting farmers in the matter. That scheme was dependent on the exercise by farmers of the powers given to them under the Agricultural Credits Act, 1923, to obtain loans at cheap rates under the Act, after forming themselves

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into associations for the purpose. Such associations could purchase lime in bulk on the credit obtained under the Act. The interest payable on loans at the start of the scheme was 4 per cent., and a period was allowed for repayment of principal and interest, longer or shorter according to the quantity of lime used per acre.

2. That scheme was not, however, taken up by farmers to any appreciable extent, and the Agricultural Credits Act, 1923, was later superseded by the Agricultural Credits Act, 1928, which had quite different provisions. Under the latter Act, owners of land can borrow money on long-term rates from the Agricultural Mortgage Corporation, or a tenant can raise money on the security of his stock and crops. Whether any capital needed for liming operations is to-day being borrowed under this Act is a matter on which we can obtain no definite information, as particulars of the purposes for which loans are obtained from banks, etc., are not available, but we think it is unlikely that much is being borrowed for liming.

3. Another series of Acts which it was thought might be made to assist liming is that of the Improvement of Lands Acts, under which the Lands Improvement Company (and the Agricultural Mortgage Corporation) are empowered to lend money to landowners at cheap rates for specified works on farms or estates. These specified works do not include liming. On inquiry, we find that the operation of liming, being usually a tenant's job, was not included as a fit subject for a landlord's loan. We consider, however, that it would be a great advantage if it could be included. If it were, the loan would presumably have to be to the landlord, who in the case of a rented farm could be recouped by the tenant paying him an agreed temporary increase in rent to cover the cost of the liming. Few landowners would be averse to co-operating in a scheme of this sort, which, besides being of benefit to their tenants, would undoubtedly add to the value of their land. If it were a man's own farm, then there seems to be every reason why the Company should be enabled to lend money to meet the cost of this exceptional and important agricultural operation. The Standing Committee suggests that the Ministry of Agriculture and Fisheries might be asked to look into the matter of this legal shortcoming with a view to its amendment.

4. Further, the Committee suggests that the Ministry should also be invited, at the present juncture, to undertake a wide scheme of propaganda in favour of liming. Local Authorities and their Agricultural officers might be asked to give it special attention, and the Ministry might consider whether it could not, as a matter of urgency not unconnected with a Defence policy, acquire means to assist owners and tenants in special cases, (i) by way of helping to secure reductions in transport rates for lime where these are unduly heavy, and (ii) by lending Government money from a special fund to be created for the purpose in cases where the County Agricultural Organizer could certify that a farmer was for some stated reason without ability to borrow money for liming under the existing Acts; the amount so required would probably be small, but the effect of the existence of such a provision would, the Committee thinks, be of considerable propaganda value.

APPENDIX V

Report from the Standing Committee on the Report referred back from the last Council Meeting on the Tuberculin Test for Imported Cattle

1. The Report dated June 4, 1936, of which a copy is attached, was referred back to the Standing Committee for further consideration at the

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last meeting of the Council (June 19, 1936). The suggestion was that what was required was the testing of *breeding* cattle before export from Ireland, in the same way as cattle sent abroad from this country had to be tuberculin tested, and, further, that the single tuberculin test might be of some assistance in reducing the proportion of infected animals.

2. The Standing Committee went again into the whole question with a view to seeing whether some method could not be found which might be recommended to authority on the lines of dealing with part only of the imported breeding stock. The Committee were unsuccessful. It should be realized that over 40 per cent. of the bovine animals imported from Ireland come within the category of animals fit for breeding, which means that approximately 350,000 cattle are under consideration. To pass these animals through a single tuberculin test, would mean adding to their cost, and would involve setting up a heavy piece of administrative machinery with no very useful purpose gained. The animals, as soon as they come to this country are mixed with the ordinary herds and would, if they were free from tuberculosis before, become liable to immediate infection. As regards the comparison with cattle sent abroad, these animals cannot be considered as requiring similar conditions of export to the comparatively few pedigree cattle which are sent from England to countries abroad which are either free or nearly free from tuberculosis, and require that high-priced imported animals shall be free from the disease.

3. The general position, therefore, is as indicated in the previous Report of the Standing Committee attached. Because of the present incidence of tuberculosis in this country, it would be anomalous to attempt any general scheme of eradication or reduction on the basis of elimination of cattle in home herds found to react to the tuberculin test. Since that is so, it could not reasonably be suggested for store cattle from Ireland unless these cattle were known to be virulently infected with tuberculosis. That is not the case, and further, the Committee, having made certain inquiries as to the steps taken both in Northern Ireland and the Irish Free State to reduce bovine tuberculosis, are satisfied that these efforts are not less than those proceeding in this country under the Tuberculosis Order and by the voluntary establishment here of attested herds, i.e., herds officially declared after testing to be entirely free from tuberculosis, which, incidentally, are fully protected against infection from newly-introduced animals, whether home-bred or imported. The position would be entirely different if a majority of the herds of this country were attested.

Copy of Report from the Standing Committee on the Question of Tuberculin Test for Imported Cattle, dated June 4, 1936

1. At the last meeting of the Council (December 12, 1935) a resolution, moved by Mr. D. G. Watkins (Hereford) to the effect that all cattle entering this country from foreign ports should be subjected to tuberculin testing, was referred to the Standing Committee for consideration and report.

2. The position is that apart from special consignments of pedigree cattle, the importation of cattle from countries outside Great Britain is either prohibited or confined to those animals intended for slaughter at the port of landing, except in the case of cattle from *Canada*, the *Channel Islands* and *Ireland*.

3. So far as *Canada* is concerned, breeding cattle are always subjected to the tuberculin test before shipment: that is by Canadian Order. Cattle incapable of breeding are in most cases imported as fat for slaughter.

4. As regards the *Channel Islands*, the Islands are free from tuberculosis.

5. As regards *Ireland*, in 1935 there were 851,340 cattle imported, of which 213,440 only were fat, the remainder (637,900) being stores distributed to farms. Tuberculosis may be reckoned to be about as prevalent

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among cattle in Great Britain as it is in Ireland, and the limitation of imports to cattle from Ireland which had passed the test would reduce the available supply of store cattle below the needs of this country, and might raise the price of stores to a prohibitive figure. No compensating advantage could be looked for from such limitation because, in view of the prevalence of tuberculosis in this country, imported cattle, even if certified free from that disease on entry, might easily become infected again by contact with other cattle. There is the further point that a single tuberculin test could give no guarantee that the animal was free from disease. A second negative test, after an incubation period of at least 60 days *in isolation*, would be necessary to detect animals which were in the incubative stage of tuberculosis. Apart, therefore, from the consideration that testing before entry would be likely to serve no useful purpose, its cost would probably be such as to make it commercially impracticable.

APPENDIX VI

Report from the Standing Committee : the Government's Live Stock Industry Bill

1. As the Council is aware, the Standing Committee has for some years past kept in close touch with the developments in the live stock industry and has watched the effect of Government measures in connexion with that industry. A brief summary of its activities is here stated so that the Council can have the full picture before them.

2. In January, 1928, the Standing Committee reported to the Council that the existing methods in regard to the sale of home-grown live stock and meat were unsatisfactory and as a rule operated seriously against the interests of farmers; farmers were too much in the hands of dealers and auctioneers; and that selling cattle by live-weight should be universal instead of being employed only at some markets. It added that there were too many small markets dominated by a few dealers, and better prices would be secured if business were concentrated in the large auction marts. It favoured the co-operative sale of cattle, and the co-operative slaughter and sale of dead meat on behalf of the producer. It recommended that there should be a general grading-up of the livestock produced on farms, starting with the elimination of the scrub bull. The farmer was advised to breed carefully for the modern beef market, which required smaller joints and smaller cuts of high quality beef. More cold storage was advocated to hold surplus supplies of home-killed beef off the market and to allow of longer hanging in order to bring these supplies into the right condition for consumption. The Committee shared the views expressed by many farmers that the margins between producers' and consumers' prices were unjustifiably wide and that the margins had tended to increase in recent times. It recommended that the attention of the Ministry and the Food Council should be again directed to the meat position.

3. At the end of 1928, the Committee returned to the subject in a Report presented to the Council and adopted by it in December of that year. It urged an early improvement of the live stock position, recommending :—

- (i) A system of grading fat cattle into three grades on presentation at the market.
- (ii) Co-operative slaughter for stock and grading as to actual quality of meat before sale on behalf of the farmer.

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- (iii) The overhauling and systematizing of the organization of markets, with the elimination of the smaller markets and the division of stock more evenly and proportionately.
- (iv) Improvement of the system of market intelligence.
- (v) Growing more cattle foodstuffs on farms and any other measures which would be likely to even out the customary rush of cattle on the autumn market, leading invariably to decline in prices.
- (vi) The grading and marking of beef in the three grades of the National Mark in order to differentiate it from Scotch, Argentine and other imported meat, and from ungraded English meat.

4. The Standing Committee again reported to the Council in December, 1933, stating the urgent need that then existed for Government action to obtain improved prices of British beef, the grazier's position being then desperate. The Report of the Reorganization Commission on beef marketing was then being awaited.

5. In June, 1934, the Committee obtained the Council's agreement to its views on the Reorganization Commission's Report. The principal of these were that it found that about 47 per cent. of the cattle which were both fattened and slaughtered in England and Wales were cows and bulls, and not good quality beef cattle, and it could not approve of the presentation to consumers of such high and increasing proportion of inferior grades of beef without any system whatever of distinguishing the meat of it from that of the many good class (non-National Mark) steers and heifers specially bred and fattened for the beef market. A proper marking of beef scheme would be helped if cattle were killed at central abattoirs, rather than at private slaughter-houses. If the Government's proposal subsequently made in the White Paper on the live stock situation (Cmd. 4651), dated July, 1934, as to levy on imported cattle and subsidy on home-produced beef, were adopted, the subsidy should be on a differential basis according to quality.

6. In July, 1934, the Cattle Industry (Emergency Provisions) Act of that year was passed, which introduced the 5s. subsidy per cwt. live-weight on the market sale of all fat cattle reaching a prescribed standard of quality.

7. In December, 1934, the Standing Committee reported congratulating the Cattle Committee on the working of the Cattle Industry (Emergency Provisions) Act, 1934, up to date, adding that it felt confident that if the Government were able to proceed with success on the lines mapped out in the White Paper (Cmd. 4651), the industry would revive and flourish.

8. In the Report in December, 1935, on the Ministry's scheme for the grading and sale of fat cattle by dead-weight, operated by the Ministry's graders through a few central markets (the number of which the Committee thought should be increased) the Committee said that the very severe strain on producers through uneconomic prices still continued, and it expressed the hope that the remaining stages of the meat negotiations with the Dominions and foreign countries would be carried through with the utmost possible speed in order that the industry might be restored to a healthy position without further delay.

9. It is true to say that the live stock industry is still to-day in a most serious position. Prices are lower than they were in December, 1934, when we had to report that the great strain on producers through uneconomic prices still continued. Since that time the live stock industry has struggled on in the hope of the market righting itself, and had it not been for the cattle subsidy of 5s. per live cwt. disaster must have overtaken it. The industry, in trying to adjust itself to the situation, has suffered injury through (i) losing still more of its beef producers who have been

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forced into other branches of agriculture, e.g., milk production, and (ii) a decline in the quality of beef produced.

10. The Committee now welcomes the Government's policy defined in the statement made by Mr. Walter Elliot in the House on July 6 last as involving the policy of a regulated market with maximum supplies of meat for the consumer consistent with a reasonable level of remuneration for the producer: the market to be regulated so far as overseas supplies are concerned by an International Meat Conference, representative of the United Kingdom, other Empire countries, and those foreign countries which supply substantial quantities of meat to the market: customs duties to be levied on imports of chilled, frozen and other descriptions of beef and veal from foreign countries: the subsidy paid to producers of fat cattle in the United Kingdom to the increased amount of £5 million per annum until such time as the conditions prevailing in the industry improve. As a precautionary measure, the Minister added that the Government would ask Parliament to give them general power to regulate imports of live stock and meat should the need arise.

11. Since that announcement was made, a Live Stock Industry Bill has been prepared, as to which the Standing Committee has, on certain essential points such as the method of payment of the extra quality subsidy, the regulation of markets, and central slaughtering, been informed and consulted from time to time. The Bill has not at this date been published and the Committee is unable therefore to comment in detail upon it, except to say that it thinks the measure is one likely to prove of great value to the industry in that, on the one hand it proposes substantial benefits in the shape of increased subsidies for good quality home-produced fat cattle, makes provision for their being well marketed in the producer's interest, and proposes certain general benefits for the industry through rationalization of internal markets, slaughter-houses, and for better business organization in the industry generally. On the other hand, the measure includes machinery to restrict overseas supplies so that the home market will not be unduly prejudiced. Another Bill is, we understand, to be proposed to deal with the financial provisions for the levy on foreign chilled and frozen beef and veal. The Committee proposes to make a further Report to the Council on the details of the measure when they are published, and it would not hesitate, if it felt it advisable in the public interest, to call a special meeting of the Council to consider and discuss that measure alone.

JANUARY ON THE FARM

E. J. ROBERTS, M.A., M.Sc.

Retrospect. From a farmer's standpoint the results of most years can be viewed with mixed feelings, and 1936 is no exception. On the whole, agricultural produce realized better prices, as can be seen from the Price Index of agricultural produce published monthly in this JOURNAL; feeding stuffs, however, were dearer from the end of summer, creating a difficult situation following the disastrous hay harvest. Milk not only realized rather better prices, but, owing to the abundance of grass, was produced more cheaply and in greater quantities in the grass season of 1936 than in the previous year. Against this, however, must be set the late start, with almost no growth of grass in April. In a discussion recently with a few dairy farmers, the opinion was expressed that udder troubles have rarely been so frequent as in 1936; milking machines have been blamed in some instances, but, on further inquiry, one finds that neighbouring herds where hand milking is practised are affected to the same extent.

Although the prices for fat cattle have not differed much from those of last year, the cattle have cost more as stores. It is encouraging for breeders, however, to observe a slight improvement in the prices for store cattle, since this gives reason for hoping that some of the subsidy is indirectly reaching raisers of such cattle. Very little of the beef subsidy goes directly to the store cattle areas; thus, in the six months March-August inclusive, only 31,466 cattle were approved for subsidy in the whole of Wales, while four times this number were approved in the northern counties of England. In some areas where store cattle are raised, breeders have attempted to right the situation by finishing the cattle that they normally sell as stores. Although the prices of finished cattle have been so low in the past three years, it is satisfactory to learn from the recently issued report of the Imperial Economic Committee ("Meat," H.M. Stationery Office) that the proportion of home-produced beef and veal increased from 48 per cent. in 1929 to 52 per cent. in 1935.

Sheep prices have constituted the brightest spot in the past

year's farming transactions; there is, however, an uneasy feeling in some quarters that the interest in our breeds of sheep shown by lamb-exporting countries may make this a short-lived prosperity. One result of the brisk demand for fat lambs has been the ease of disposing of the heavier types compared with a few years ago. One would not, however, be true to agricultural tradition, if a bright spot were mentioned without referring to some counter-balancing difficulty. The wet summer has been responsible for a heavy increase in losses from the nostril fly and from pneumonia following infestation with lung worms; a very severe form of foot-rot is also prevalent.

The better prices of pig-meat in the later months of the year made 1936 a rather better year for receipts than 1935, though the increased prices of feeding stuffs robbed the producers of much of the advantage. In the report of the Imperial Economic Committee, referred to above, it is stated that home-produced pig-meat accounted for half our consumption in 1935, against 39 per cent. in 1929—an increase that amounted to 2·75 million cwt. It is probable that this proportion was maintained in 1936.

Horse breeding has enjoyed another favourable year. Prospects are rosy; the demand for foals was a feature of the autumn sales, there being an advance in prices and an increase in the numbers sold. The Shire Horse Society, up to September, registered 286 stallions and 938 females, against 251 stallions and 826 females for the previous year. As regards the threat from foreign horses, Major James Paterson, of the transport firm of Carter, Paterson & Co., reporting some experiences with Polish and Russian horses to the National Horse Association, remarked that, in the general opinion of horse users, British bred horses are superior in lasting qualities where the pace is fast or the surface hard. Imported animals are of hardy constitution and are temperamentally docile, but their bone is not so hard, and foot troubles arise from the fact that concussion renders them more subject to ring and side-bone.

In crop production, the unfavourable harvest weather constitutes the predominant feature of the year. In the hay harvest, the crop was not only difficult to get, but on many farms much had to be burnt, particularly in the Midlands, where two or three dry days in succession were rare. At the Leicester City Corporation farms, the rainfall amounted to

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4.40 in. and 5.33 in. for June and July respectively, against 2.53 in. and 0.92 in. in the same months of 1935. There was more hay-making than harvesting of corn in August in many districts, second cuts being taken. It is generally believed that, though the weather may be good, August hay is of inferior quality; according to chemical composition, however, as shown by Woodman and by Fagan, August hay from a properly managed sward should be very little inferior to June hay.

The corn harvest proved to be as disappointing as the hay harvest, and the crops remained in the stooks in many districts twice or thrice as long as usual. The actual fall of rain was not so heavy, but showers seemed to arrive as soon as the corn was ready for loading; thus, in August, the fall of rain was less than 1 in. at Leicester, and only 1.36 in. at Bangor. A year ago there were many reports of wet corn stacks at threshing time, caused by the prolonged rain, and, perhaps, careless stacking, after a good harvest. This year there are some reports of poor coloured corn following the wet harvest; those with graindriers feel pleased with their investment. On the whole, however, there is satisfaction, though in some districts it is said that crops that looked heavy have threshed out disappointingly. A grower on a mechanized farm in Bedfordshire describes 1936 as the worst year he has known.

Sugar-beet. Some of the land intended for beet has had farmyard manure and a deep ploughing by this time, though much of this will be done this month, weather permitting. The ploughing should be as deep as possible, 12 in. being a suitable depth. The farmyard manure should be ploughed in during winter, or, at latest, in early spring; late applications not only mean late ploughing with the possibility of burying a good frost-made tilth, but may also result in a number of fangy roots.

The value of beet tops is well appreciated and is estimated at from 50s. to 100s. per acre. A correspondent writing in *The Scottish Farmer* (March 14, 1936) stated that, on the tops from 27 acres, he had fed 400 hoggets, maintained 75 cross-bred ewes, and 60 head of cattle from October to the middle of January. In his experience, it was difficult to find turnips good enough to keep the sheep going on should they not be finished on the sugar-beet tops.

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Manuring of Meadows. Applications of manures other than quick-acting nitrogenous manures are made during the winter. If slag is to be applied, this should be done as early as possible. Farmyard manure should be spread before the end of February, since a late application—particularly in a dry spring—results in much of the manure being held in the sward. Farmyard manure, well spread in good time, can be relied upon to give good results. In an experiment that has been continued for over ten years at the College Farm at Bangor, this manure, applied annually, has given yields of meadow hay consistently higher than any combination of artificials, without any deterioration occurring in the quality of the crop. It must, however, be added that, both in spring up to the end of April, and again in autumn, the plots are grazed very closely by mountain sheep. The following average yields per acre were obtained for the years 1924-36 (excluding 1933) from the annual applications of the manures specified:—

	<i>cwt.</i>
Farmyard manure	39½
Slag alone	26½
Complete artificials	35½
Complete artificials, minus potash	30
Complete artificials, minus phosphate	36½
Complete artificials, minus nitrogen	35½
No manure	29½

The experiment provided many surprises. The diminution in yield caused by the annual dressings of about 6 cwt. slag, no reduction in yield by the omission of nitrogen, or of phosphate, and the obvious response to potash, in view of the heavy character of the soil, were unexpected results. Perhaps the most striking lesson drawn from this experiment is the importance of farmers carrying out small trials, and not to assume that the requirements of crops by all fields follow certain general rules.

Ordering Seed. The rush to order seed for spring wheat will not be so great this year as last year, when the autumn sowing was interrupted by the continued rain. In view of the general opinion as to the failings of spring wheats it is interesting to recall that, at the last Cambridge and Isle of Ely Grain Exhibition, the first prize for milling wheats was won by a Suffolk grower with April sown Mars de Suede. The crop followed roots folded off by sheep and was badly laid. The

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variety is a strong wheat, but was neither a good yielder nor strong in the straw. The better known varieties are Red Marvel and April Bearded; the N.I.A.B. has recommended Little Joss for sowing before the middle of February, Red Marvel from that time to the middle of March, and April Bearded for drilling after that.

Many will also be ordering barley this month. Some growers of malting barley believe in sowing in February where possible; in some counties, Essex in particular, much of the malting barley is even sown in the autumn.

Shelter for Ewes and Lambs. Although breeds of sheep differ so much in ability to withstand wet, cold conditions, a certain amount of shelter is essential to even the hardiest just at lambing. Even a vigorous, well-covered lamb may be quickly rendered helpless if it is exposed to cold rain immediately after birth. Arable flocks are not hardy, and, in addition, are folded on large, open fields. The pens, either permanent or temporary, provide the necessary shelter for such flocks. With grass flocks, hedges, irregularities in the surface, or woods are often the only shelter; where there is no such natural shelter, as on the Romney Marsh, a few hurdles are all that may be provided. Shelter belts of trees are of great value, and in the leases of some farms with such woodland there is often a covenant by which the landlord undertakes to replace any trees felled. There are fine examples of shelter belts on the Cotswolds, and from now until the warmer weather many flocks may be seen getting the benefit of such wind-breaks. An excellent shelter of this sort may be seen near the Sutton Scotney to Stockbridge road in Hampshire; this wind-break consists of a long wood, with transverse plantations at intervals. One of the disadvantages of the breaking-up of estates consists in the cessation of planting such wind-breaks. Some farmers, however, contend that, invaluable as they are for stock, they have the disadvantage of harbouring rabbits and pigeons.

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The Place of Fertilizers in Grass Land Management.

Any measures for the improvement of grass land by the application of lime or mineral manures are usually put into effect during the autumn and winter, so there is little time left to carry out any improvement contemplated for the coming season. Grass land can be highly productive if it is properly managed and adequately fertilized, but, in the absence of proper care and attention, its productivity may fall to a very low level.

The standard of production on any particular farm is inevitably bound up with the potential means of utilizing the produce, whether as grazing, hay, or conserved for sale or winter use in the form of silage. There is obviously little point in spending money on fertilizers to produce grass for stock that are losing money. It is equally useless to attempt to maintain an improved sward unless it is stocked to full capacity or the produce is removed as necessary and conserved for future use. Understocking, in the absence of systematic cutting, is invariably the first step towards pasture deterioration, and no adjustment in the manuring policy can prevent this.

Whether or not the maintenance of his grass land at a higher level of productivity will be an economic proposition is for the farmer himself to decide. He alone knows whether he has the capital required for heavier stocking, and whether the stock, or any other means he may have of disposing of the increased produce, is likely to leave a profit. On the other hand, there are fields on which production of herbage is at a high level, but an improvement in quality may be desired. Application of manures may influence both the type of herbage, as will be shown later, and the mineral constituents such as calcium and phosphorus contained in the herbage. These mineral constituents are of great importance to rearing stock and milch cows, which cannot thrive or maintain their rates of production on herbage deficient in minerals. It is important, therefore, to look at the problem not only from the standpoint of yield of herbage, but with reference to the suitability of the herbage to supply the needs of the stock it is intended to support.

Gradual awakening to the possibilities of the value of grass as a food for stock, and the increased productivity that can

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be brought about by proper attention to the management of grass land, have resulted in a tremendous expansion in the investigational work on this question. What fertilizer to use, when to use it, and in what quantity it should be applied, are no longer regarded as the chief problems in grass land management. Indeed, though fertilizer applications can do much to ensure a satisfactory amount of good quality herbage, other points in management, especially the density and periods of stocking, have frequently a much more immediate and pronounced effect on the productivity of a pasture. The complexity of the problem is apparent from the vast amount of information that has been published during the last ten years—from Aberystwyth on seeding, management and botanical problems; from Cambridge on the composition, digestibility and feeding value of pasture grass; and from a number of other centres dealing with the application of these problems under local conditions, and with such allied problems as the conservation of young grass by artificial drying or ensilage.

In recent years, opinions as to the relative importance of the various operations that constitute grass land management have changed considerably. Herbage species, cultivations, stocking and manuring, all play an important part. In these notes we are primarily concerned with manuring, but it must be remembered that the application of any manure has a direct influence on the herbage species, e.g., basic slag is usually held to encourage the spread of wild white clover, while frequent doses of sulphate of ammonia tend to decrease the proportion of that species. With either dressing, however, the final effect of the fertilizer may be modified by a change in the grazing policy; the increase in clover, following the application of the slag, will be less if the first grazing is deliberately delayed and the pasture is allowed to grow away in the spring, while on the other hand, close grazing may mitigate the reduction in clover consequent on the application of sulphate of ammonia.

What then should be the policy of the farmer who wants his pastures to provide as much grazing as possible over the longest period of the year. In the long run, the soundest policy is usually to maintain between grasses and clovers a balance that will give the bulk and quality of herbage nearest to the requirements of the stock it is proposed to carry. The way in which manures can help to achieve this result

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can best be judged from an appreciation of the effects likely to be produced by the various types of fertilizer. These can only be summarized very briefly in these notes—it is for the individual farmer to apply these general principles to the conditions and requirements of his own farm.

Manuring Pastures. For a poor, worn-out pasture a light dressing of short, well-rotted *farmyard manure* is invaluable. In other circumstances, however, farmyard manure can generally be used to greater advantage on the arable land or the hay crop.

The importance of *lime* is sometimes questioned, but, though it is often possible to avoid the necessity for applications of lime by the use of basic slag as the phosphatic fertilizer, there are many occasions when it is better, in the long-run, to apply lime. Lime deficiency so often brings in its train a variety of other troubles that it rarely pays to ignore it. The lime must be worked into the soil. In a system of alternate husbandry this is easy if the lime is applied for one of the arable crops, but, on old pastures, reliance has to be placed on severe harrowing.

An application of a *phosphatic* fertilizer often produces very striking results on old pasture. The chief effect is the well-recognized increase in the wild white clover in the herbage, which, in turn, will exercise a beneficial effect on the grasses if the grazing is properly controlled. Of the various types of phosphatic fertilizer, *superphosphate* is most useful on dry, sandy and chalky soils, whilst *ground mineral phosphate or rock phosphate* can be used to best advantage on acid soils under conditions of high rainfall. In such circumstances, ground mineral phosphate will often act as quickly as the low-soluble types of basic slag, provided it is really *finely ground*. On the great bulk of our pastures, however, *basic slag* seems to be the best choice.

The recent introduction of new grades of *basic slag* has caused confusion in the minds of some farmers as to the basis on which different types should be compared. It is, however, still true to say that citric-solubility affords a fair guide to the availability of the phosphate in the slag. Although this figure is not always included in quotations, it will usually be supplied on request. A sample with a citric-solubility of 80 per cent. or over will usually prove fairly quick in action, and should always be used where an early response is desired, or where conditions tend to be unfavourable to the efficiency

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of fertilizers that are not water-soluble. The less-soluble types of slag can frequently be used with success on the heavier and wetter types of soil, but, under dry conditions, such as on the light soils in the east of England, high-soluble slags are usually the wisest choice. An application of basic slag should always be accompanied by some mechanical treatment, usually harrowing. In the absence of such treatment response to the slag may be slow. The severity of the harrowing should be determined by the turf itself—the more rough patches there are and the greater the accumulation of undecayed mat, the more severe should be the harrowing. One other point is worth remembering when using basic slag, namely, for pasture that has not recently received a phosphatic fertilizer, the initial dose should be heavy; the equivalent of 8 to 10 cwt. per acre of a slag containing 14 per cent. P_2O_5 , in one dose, will usually give better results than the same quantity applied in, say, two separate doses. Subsequently, 4 to 5 cwt. per acre every three years should suffice. Instances have recently been recorded in which, on very poor grazings, even heavier initial doses were necessary; such instances, however, are usually on land that is in exceptionally low condition, and that frequently requires some other treatment, such as a seeding of wild white clover, before even the heavier dressings of slag will produce much improvement in the herbage.

The need for *potash* fertilizers on pasture land is more difficult to define. Potash is usually required on chalky, peaty and sandy soils, and any failure to get a response from phosphatic fertilizers should be followed by a trial dressing of some potash fertilizer. There is little to choose between the various types of potash fertilizer so far as their use on grass land is concerned. The cheapest per unit will generally serve just as well as the more expensive ones.

The use of *nitrogenous* fertilizers on pasture land is still not common in this country, and, so far, has been largely confined to “rotational grazing” or to encouraging the growth of herbage at special seasons of the year, points which will be dealt with in a future note.

Manuring Meadows. To produce a bulky crop of hay, *nitrogen* in some form is essential. There is nothing to beat *farmyard manure* for meadow land, provided it is used in reasonable amounts. Heavy annual dressings of dung alone, however, are the surest way to a weedy sward and rank,

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rather unpalatable, herbage—not infrequently found in the past on small grass farms devoted almost entirely to milk production. The balance and quality of the sward can only be maintained by supplementing the farmyard manure with adequate amounts of *lime* and *mineral fertilizers*. Where farmyard manure is available, the soundest policy is to give a good dressing every third year. Superphosphate or high-soluble basic slag, equivalent to about 5 cwt. per acre of a 14 per cent. P_2O_5 grade, should be given in one of the two intervening years, together with potash where necessary. A small dressing of nitrogenous fertilizer can be used in years when dung is not given, if growth is not satisfactory. Even with unlimited supplies of dung, it is not wise to use it more often than once in two years, and a phosphatic fertilizer, with potash where necessary, should then be given in the intervening years. Meadow land should be more liberally treated with potash than pasture land, though the need for potash is less when dung is used.

In the absence of regular dressings of dung, meadow land should receive adequate treatment with artificial fertilizers. This will obviously vary from farm to farm, but a suitable sort of treatment would often be 6 cwt. basic slag (14 per cent. P_2O_5) and 2-3 cwt. 30-per-cent. potash salts per acre, every third year, in conjunction with an annual spring dressing of $1\frac{1}{2}$ cwt. per acre nitro-chalk. Alternatively, about 4 cwt. per acre of a complete mixture should be applied each spring, e.g. 2 cwt. superphosphate, $1\frac{1}{2}$ cwt. sulphate of ammonia and $\frac{1}{2}$ cwt. muriate of potash.

The use of lime on meadows is even more important than on pastures. It makes for good quality hay, and, on soils that show any tendency to become acid, about 10 cwt. per acre of burnt lime, or its equivalent, should be given every three years. Lime is particularly important on land that receives regular dressings of dung, but the two should not be applied in the same season.

The above recommendations for meadow land can be used as the basis of a definite manuring policy on the lines already advocated for arable crops. The adoption of such a policy would automatically solve what is an annual problem on many farms, namely, by what means and to what extent meadows shall be, or can be, temporarily stimulated. It would also ensure that the maximum benefit would be obtained from applications of dung.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Dec. 16.				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 od	7 od	7 od	7 od	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia :—					
Neutral (N. 20·6%) ..	7 od	7 od	7 od	7 od	6 10
Calcium Cyanamide (N. 20·6%)	7 oe	7 oe	7 oe	7 oe	6 10
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 26— 27½%) ..	2 10a	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	2 19	..	2 19f	2 16g	3 6
" (S.P.A. 13½%) ..	2 15	2 13	2 15f	2 12g	3 10
Bone Meal (N. 3½%, P.A. 20½%) ..	..	6 10	6 5h	6 10	..
Steamed Bone Flour (N. ¾%, P.A. 27½—29½%) ..	5 12	5 10	5 0h	5 0	..

Abbreviations: N.=Nitrogen; P.A.=Phosphoric Acid;
S.P.A.=Soluble Phosphoric Acid; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra; for lots of 2 tons and under 4 tons, 5s. per ton extra; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons, the price is 5s. per ton extra; for lots of 1 ton and under 2 tons, 10s. per ton extra; for lots of 10 cwt. and under 1 ton, 15s. extra; and for lots of less than 10 cwt. but not less than 2 cwt., 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22·4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

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Mineral Supply. The fact that the animal body and animal products contain mineral ingredients, the supply of which must be covered by the food, has been brought into prominence in recent years through the repeated demonstration that many cases of unsatisfactory progress or even ill-health under practical farm conditions are directly traceable to mineral deficiencies. The realization of this fact has developed a tendency, however, towards the indiscriminate addition of minerals to rations without any consideration as to whether such addition is necessary or desirable. It is certain that in many instances such additions have had detrimental effects, these having been due in some instances to the creation of an actual excess of minerals and in others to the establishment of an unfavourable balance between the individual mineral elements. The proper use of mineral supplements can thus clearly only be based upon a knowledge of the mineral content of the foodstuffs included in the ration, and of the mineral requirements of the class of animal to which it is to be given.

The subject is too complex to permit of more than a few of the major features being touched upon here, since many mineral elements enter into the composition of the animal body, the chief being potassium, sodium, calcium, magnesium, iron, phosphorus, sulphur, silicon, chlorine and iodine. Varying amounts of each of these elements are lost from the body day by day in the dung and urine, whilst further loss takes place if products such as milk or eggs are being removed. Should the supplies in the food be inadequate to cover these losses the deficiency must be made up from the substance of the body itself, a procedure that is clearly undesirable, and, if persisted in, must inevitably become deleterious to progress and health.

In practice, the effects of a mineral deficiency, unless it is very severe, are apt to develop only slowly, and may, therefore, escape notice until serious trouble is imminent.

If the shortage is only of brief duration no harm is done, since the animal has a limited power of storing up reserves

NOTES ON FEEDING

of minerals during periods of excess supply, upon which it can draw when the need arises. This applies particularly to the storage of calcium and phosphorus in the skeleton, which is the great reservoir from which the needs of the body for these two elements are supplied. The extent to which the reserves in the bones can be depleted without injury to the bone is limited, however, and a continuous withdrawal must inevitably lead to bone trouble. In the young, growing animal, where any reserve must be small or non-existent, the bones fail to harden properly, and the characteristic lameness or deformation described as "rickets" soon ensues. In adult animals, the bones acquire a brittle character and easily break (osteoporosis). The trouble may be caused by deficiency of either calcium or phosphorus, although the precise effects may differ in points of detail. The problem is not entirely one of the amounts of calcium and phosphorus supplied in the food, since other factors, notably the presence of vitamin D, are essential to ensure proper assimilation and deposition of the minerals.

The familiar need of animals for a supply of salt gives another example of the importance of mineral supply. This mineral, which is a combination of the elements sodium and chlorine, supplies the essential hydrochloric acid and soda for the digestive juices; it promotes the digestion of fats and proteins, facilitates the circulation of nutrients through the cells of the body tissues, and generally improves the palatability of foods. A less familiar function of the sodium of the salt is that of counteracting the otherwise detrimental effects of any excess of potassium. So important and varied are the functions of salt that a small addition to the ration can rarely be out of place with any class of animal, and is probably actually needed more often than that of any other mineral. In practice salt requirement probably reaches its highest point with the milk-producing animal, since milk contains appreciable quantities of sodium and chlorine.

Other examples of the fundamental importance of specific mineral elements are the need for iron for the production and effective action of the red-blood corpuscles, and that for iodine for the proper working of the thyroid and other important glands.

The practical adjustment of the mineral supplies in the food to the actual needs of the animal can only be made very roughly, (1) because of our very imperfect knowledge as to

NOTES ON FEEDING

the precise requirements of the animal, and (2) because of the great variability in mineral content of every foodstuff according to the conditions under which it is produced. The latter difficulty is least with the concentrated foods derived from grains and seeds, and greatest with roots, greenstuffs and fodders. As a rule we have no alternative but to use average figures, and therefore, must be content with a rough estimate of the mineral supplies.

Such average figures for the lime, phosphoric acid, potash and chlorine in a number of commonly-used foods are available in the table on p. 62 of Bulletin 48 (Rations for Live Stock) issued by the Ministry, 1s. 2d. post free.

A survey of these figures leads to certain broad conclusions as to the amount and general nature of the mineral supplies in different classes of feeding stuffs. Before dealing with these, however, certain other considerations relating to the "balance" between the individual mineral elements need to be discussed.

First, we must take into account that certain of the elements (the metals) are basic in character, whilst others are acid. There is much evidence from experimental work in support of the view that any considerable excess of bases over acids or of acids over bases in the ration is undesirable. In this connexion it is perhaps significant that in the minerals of milk, Nature's food for the young animal, the chemical balance between basic and acidic elements is almost exact.

Secondly, apart from the general relation between total bases and total acids there are inter-relations between certain specific elements that should be taken into account. The most important of these are the ratio of calcium to phosphorus and the ratio of potassium to sodium. Mention has already been made of the separate effects of deficiency of calcium or deficiency of phosphorus in causing rickets or osteoporosis. It must be realized, however, that the two are interdependent, and that the ratio between them may be as important as the actual amounts of each present. A ration may supply liberal amounts of calcium and phosphorus and yet give rise to bone trouble owing to one being too greatly in excess of the other.

The practical importance of the ratio of potassium to sodium lies in the fact that an excess of potassium tends to displace sodium from the body and thus increases the rate of loss of the latter in the urine. A supply of sodium (salt) that would be adequate in the presence of a suitable supply of potassium

NOTES ON FEEDING

may thus become inadequate if the latter is in excess, and in these circumstances the supply of sodium in the body is depleted.

A further complication that arises in attempting to arrive at a correct representation of the balance of the various elements lies in the fact that the weights (or percentages) of the various elements are not true measures of their chemical reactive powers—and it is the latter that determine their effects in the body. Thus, 23 parts by weight of sodium are equivalent chemically to 39 parts of potassium; therefore, in a ration containing 0.23 per cent. each of sodium and potassium the apparent exact balance (ratio 1 : 1) is misleading, since the true *chemical* balance is:—

$$\frac{0.23}{23} : \frac{0.23}{39} \text{ or } \begin{array}{cc} \text{Sodium} & \text{Potassium} \\ 1 & : 0.6 \end{array}$$

In other words, the ration has not a perfect balance of sodium to potassium (assuming equality to be perfection), but actually contains a relative excess of sodium over potassium. The conception of chemical “equivalent weights” cannot be explained here, and it must suffice to point out that, in examining the various “balances” of the minerals in a ration, the percentage figures for the various minerals must be corrected in proportion to the respective “equivalents” as in the above example.

Lastly, we are faced with the difficulty of knowing what is the correct “balance” (or ratio) to aim at. On this point it is impossible as yet to get precise guidance, and perhaps the best temporary expedient to adopt is to take the mineral matter of milk as our standard, this giving us the following ratios (of “equivalent weights”) to aim at:—

Acid Equivalents	:	Base Equivalents	..	1.1 : 1
Phosphoric Acid (P_2O_5)	:	Lime (CaO)	..	1.5 : 1
Soda (Na_2O)	:	Potash (K_2O)	..	0.7 : 1

With these standards we may now compare the following ratios found in average samples of a few common feeding stuffs:—

				<i>Acid Equivalents</i> : <i>Base Equivalents</i>		<i>Phosphoric Acid</i> : <i>Lime</i>		<i>Soda</i> : <i>Potash</i>
Wheat	..	..	..	1.4 : 1	..	8.6 : 1	..	0.5 : 1
Rye	..	..	..	1.2	..	8.7	..	0.3
Barley	..	..	..	1.6	..	7.1	..	0.2
Oats	..	..	..	1.9	..	6.2	..	0.2
Wheat Straw	..	..	..	1.4	..	0.4	..	0.4
Barley	..	..	..	1.3	..	0.8	..	0.3
Oat	..	..	..	1.1	..	0.7	..	0.4

NOTES ON FEEDING

			<i>Acid Equivalents</i> : <i>Base Equivalents</i>		<i>Phosphoric Acid</i> : <i>Lime</i>		<i>Soda</i> : <i>Potash</i>
Meadow Hay	..	..	0.9	..	0.8	..	0.2
Young Grass	..	..	0.8	..	0.6	..	0.2
Mangolds	..	..	0.5	..	2.3	..	0.8
Swedes	..	..	0.7	..	1.4	..	0.4
Potatoes	..	..	0.6	..	5.8	..	0.2
Sugar-Beet Tops	..	..	0.9	..	0.6	..	1.0
Linseed Cake	..	..	0.6	..	2.1	..	0.8
Cottonseed Cake	..	..	1.0	..	9.9	..	0.2
Soya Meal	..	..	0.8	..	3.5	..	0.1
Palm Kernel Meal	..	..	0.9	..	4.8	..	0.4

It will be noted that, judged by the milk standards, the cereal grains all show a distinct excess of acid over base, a very large excess of phosphoric acid over lime, and a marked deficiency of sodium as compared with potassium. Clearly, therefore, they need to be supplemented by lime and salt.

The cereal straws show an excess of total acids, but deficiencies of phosphorus and sodium.

Hay and grass are fairly well balanced as to total bases and acids, with a slight preponderance of base, especially calcium; but are relatively low in sodium. In other words, salt will usually be the only supplement required.

Roots show a surplus of total bases, but a deficiency of calcium relative to phosphorus, and, except in mangolds, a marked deficiency of sodium relative to potassium. Potatoes have a large relative excess of phosphorus, but too little sodium.

Oil-cakes are somewhat variable as between different kinds, but on the whole are fairly well balanced as to total acids and bases, with a slight preponderance of base. They all show a large relative excess of phosphorus, and, in most instances, a marked deficiency of sodium.

Viewing these groups of foodstuffs as a whole, the main general features are an excess of phosphorus relative to calcium, and a deficiency of salt, which, interpreted in terms of practice, means that the mineral supplements most commonly needed will be lime and salt.

As to what amount of mineral supplement should be added, we are unfortunately unable to give accurate guidance, except perhaps in a few instances. With high-yielding milch cows that are receiving a fairly large allowance of roots along with hay and concentrated foods, an addition of 2 to 2½ oz. of finely-ground calcium carbonate per head daily will roughly establish a balance of bases to acids and, at the

NOTES ON FEEDING

same time, a suitable ratio of calcium to phosphorus. Along with this an addition of 1 to $1\frac{3}{4}$ oz. of common salt will give a suitable sodium-potassium ratio. Even with these additions, the needs of the cow may not be entirely covered during the period of highest milk-yield, but, if the mineral supplement is continued, especially into the dry period, any losses of minerals from the body incurred during the high-yielding period will be fully restored before the next calving.

For growing cattle, especially if they are not receiving a fair amount of good hay, a suitable mineral supplement will be 1 to $1\frac{3}{4}$ oz. of calcium carbonate, and $\frac{1}{2}$ to 1 oz. of salt per head daily, according to live-weight.

For pigs on meals and water, $\frac{1}{2}$ -oz. per head daily according to size, of a mixture of 3 parts calcium carbonate and 1 part salt will be suitable. If they are receiving fairly large amounts of separated milk or whey, no supply of salt should be necessary, but about one-half of the above allowance of calcium carbonate may be given. This should be raised to the full amount if the meal used includes a large proportion of maize, since this is the poorest of all cereals in lime, whilst relatively rich in phosphorus, and thus very badly balanced.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	7 4
Maize	78	7·6	5 10
Decorticated ground-nut cake ..	73	41·3	8 1
„ cotton-seed cake ..	68	34·7	8 5
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1·71 shillings, and per unit protein equivalent 1·38 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	6 16
Oats	60	7·6	5 13
Barley	71	6·2	6 10
Potatoes	18	0·8	1 12
Swedes	7	0·7	0 13
Mangolds	7	0·4	0 13
Beans	66	19·7	7 0
Good meadow hay	37	4·6	3 10
Good oat straw	20	0·9	1 15
Good clover hay	38	7·0	3 15
Vetch and oat silage	13	1·6	1 4
Barley straw	23	0·7	2 0
Wheat straw	13	0·1	1 2
Bean straw	23	1·7	2 2

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Wheat, British.. ..	£ s. 8 13	£ s. 0 8	£ s. 8 5	72	s. d. 2 3	d. 1.20	% 9.6
Barley, British feeding	7 0	0 8	6 12	71	1 10	0.98	6.2
„ Danubian ..	7 2	0 8	6 14	71	1 11	1.03	6.2
„ Persian ..	7 7½	0 8	6 19	71	1 11	1.03	6.2
Oats, English, white ..	7 7	0 9	6 18	60	2 4	1.25	7.6
„ „ black & grey	7 3	0 9	6 14	60	2 3	1.20	7.6
„ Scotch, white ..	8 3	0 9	7 14	60	2 7	1.38	7.6
„ Canadian, No. 2							
Western	8 17*	0 9	8 8	60	2 10	1.52	7.6
„ Canadian,							
mixed feed	6 15	0 9	6 6	60	2 1	1.12	7.6
Maize, Argentine ..	5 10	0 7	5 3	78	1 4	0.71	7.6
„ DanubianGal.Fox	6 0†	0 7	5 13	78	1 5	0.76	7.6
„ South African							
No. 2 white flat	6 18†	0 7	6 11	78	1 8	0.89	7.6
Beans, English, Winter	6 5½	0 16	5 9	66	1 8	0.89	19.7
Peas, English, blue ..	11 5½	0 14	10 11	69	3 1	1.65	18.1
„ Japanese.. ..	19 15†	0 14	19 1	69	5 6	2.95	18.1
Dari	7 17†	0 8	7 9	74	2 0	1.07	7.2
Milling Offals:—							
Bran, British ..	6 17	0 15	6 2	43	2 10	1.52	9.9
„ broad ..	7 7	0 15	6 12	43	3 1	1.65	10
Middlings, fine,							
imported	7 2	0 12	6 10	69	1 11	1.03	12.1
Weatings† ..	7 5	0 14	6 11	56	2 4	1.25	10.7
„ Superfine†	7 12	0 12	7 0	69	2 0	1.07	12.1
Pollards, imported	6 15	0 14	6 1	50	2 5	1.29	11
Meal, barley ..	8 10	0 8	8 2	71	2 4	1.25	6.2
„ „ grade II ..	7 15	0 8	7 7	71	2 1	1.12	6.2
„ „ maize ..	6 2	0 7	5 15	78	1 6	0.80	7.6
„ „ germ ..	6 10	0 11	5 19	84	1 5	0.76	10.3
„ „ locust bean ..	7 15	0 5	7 10	71	2 1	1.12	3.6
„ „ bean ..	8 5	0 16	7 9	66	2 3	1.20	19.7
„ „ fish ..	14 10	2 1	12 9	59	4 3	2.28	53
Maize, cooked, flaked ..	6 15	0 7	6 8	84	1 6	0.80	9.2
„ „ gluten feed ..	6 10	0 12	5 18	76	1 7	0.85	19.2
Linseed cake:—							
English, 12% oil ..	9 10	1 0	8 10	74	2 4	1.25	24.6
„ 9% „ ..	9 0	1 0	8 0	74	2 2	1.16	24.6
„ 8% „ ..	8 15	1 0	7 15	74	2 1	1.12	24.6
Cottonseed cake,							
English, Egyptian							
seed, 4½% oil ..	5 7	0 17	4 10	42	2 2	1.16	17.3
Cottonseed cake,							
Egyptian, 4½% oil..	5 2	0 17	4 5	42	2 0	1.07	17.3
Cottonseed cake,							
decorticated, 7% oil	8 5†	1 7	6 18	68	2 0	1.07	34.7
Cottonseed meal,							
decorticated, 7% oil	8 2†	1 7	6 15	70	1 11	1.03	36.8

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
Coconut cake, 6% oil	£ s. 6 15	£ s. 0 17	£ s. 5 18	77	s. d. 1 6	d. 0.80	% 16.4
Ground nut cake, decorticated, 6-7% oil	8 2†	1 7	6 15	73	1 10	0.98	41.3
Ground nut cake, imported decorti- cated, 6-7% oil ..	8 0	1 7	6 13	73	1 10	0.98	41.3
Palm-kernel cake, 4½-5½% oil ..	6 15†	0 12	6 3	73	1 8	0.89	16.9
Palm-kernel cake meal, 4½% oil ..	6 12†	0 12	6 0	73	1 8	0.89	16.9
Palm-kernel meal, 1-2% oil ..	6 2	0 12	5 10	71	1 7	0.85	16.5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	5 17	0 11	5 6	48	2	1.16	12.5
Brewers' grains, dried porter ..	5 10	0 11	4 19	48	2 1	1.12	12.5

(a) Carriage paid in 5-ton lots. * At Bristol. § At Hull. † At Liverpool. ‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of November, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the Table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1.29d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the Table under the heading manurial value per ton are calculated on the basis of the following unit prices: N., 7s.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

MISCELLANEOUS NOTES

Investigation into the Feeding Value of Herring Meal

THE feeding of herring meal to live stock, particularly to bacon and pork pigs, dairy cows and poultry, has always been discouraged in view of the risk of producing a fishy taint in the flesh of pigs and in other products, such as eggs or milk intended for human consumption. Experiments in this and other countries, however, have shown that, apart from the disadvantage of taint, herring meal is a valuable feeding stuff, being rich in proteins and vitamins and well balanced with minerals.

The Herring Industry Board, which had given some consideration to the problem as a possible means of increasing the consumption of herring meal and affording some measure of relief to the herring industry, approached the Ministry with regard to the possibility of instituting, at the expense of the Board, research into the feeding value of herring meal. A meeting held at the Ministry, attended by representatives of the Herring Industry Board and of the various stock-feeding centres interested in the subject, considered the present state of knowledge regarding herring meal and the possibility, practicability, and usefulness, of initiating research work in connexion with this feeding stuff. It was generally agreed that any work undertaken should fall into two categories: (1) fundamental research into the cause of taint and its possible removal, and (2) straightforward feeding trials, critical and non-critical, with various classes of stock, but excluding pork and bacon pigs.

A programme of investigations prepared on these lines has now been approved by the Herring Industry Board. Fundamental research into taint will be carried out at the National Institute for Research in Dairying at Reading, where the provision made by the Board will include the salary of a bio-chemist who has been appointed to undertake the chemical investigations. Feeding trials with store cattle, dairy heifers, calves, breeding ewes, breeding sows and poultry will be carried out at the Rowett Institute, Aberdeen, and certain centres in England and Wales.

The Agricultural Index Number

THE November index of the prices of agricultural produce at 125 (base 1911-13=100) is the same as for October, and 12 points above that of a year ago. (If allowance be made

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for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index number is 129.) Advances in prices were recorded for wheat, fat sheep and pigs, poultry, butter, cheese, potatoes and wool, while barley and fat cattle were lower than in October.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117
August	121	105	105	119	113	119
September	120	104	107	119	121	127
October	113	100	107	115	113	125
November	112	101	109	114	113	125
December	117	103	110	113	114	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January	—	111	119	124	125
February	—	110	117	122	123
March	—	106	112	119	122
April	—	109	116	126	129
May	—	105	116	117	120
June	—	104	114	117	121
July	—	104	117	120	121
August	108	108	122	120	124
September	108	111	125	128	133
October	104	112	121	120	129
November	105	113	120	119	129
December	107	114	120	120	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. Wheat at an average of 8s. 7d. per cwt. was 2d. higher than in October, and the index rises by 1 point to 114. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration the figure becomes 130.) Barley was lower both in price and index, the former moving downwards from 10s. 1d. to 9s. 9d. per cwt. and the latter from

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119 to 115. Quotations for oats remained unchanged at 6s. 10d. per cwt., but in consequence of a slight rise which took place during the base period, the index at 98 shows a fall of 1 point. A year ago wheat averaged 5s. 10d. per cwt., barley 8s. 7d. and oats 6s. 1d., the indices being 78, 101 and 87 respectively.

Live Stock. Prices of fat cattle showed a slight decline; the average for second quality at 31s. 3d. per live cwt. compared with 31s. 8d. the previous month and the index declines by 2 points to 93. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, raises the index to 108. At 9½d. per lb. for second quality, fat sheep rose by ¼d. per lb.; owing, however, to a proportionately greater increase in price which occurred during the corresponding months of 1911-13, the index falls from 131 to 130. Quotations for baconers and porkers also were higher, the former by 2d. to 11s. 10d. per score and the latter by 10d. to 13s. 9d., the relative indices moving upwards from 114 to 118 and 119 to 126.

Both dairy cows and store cattle were slightly dearer than in October; the index for the former rises by 2 points to 109, but that for store cattle remains at 95. Store sheep were somewhat cheaper and this, in conjunction with a reverse movement in the base prices, results in a reduction in the index from 132 to 117. The index for store pigs shows a rise of 5 points to 155.

Dairy and Poultry Produce. The regional contract price of milk continued at last month's level and the index of 171 is repeated. Butter rose by ¼d. to 1s. 2d. per lb. as against an increase of ½d. per lb. between October and November of 1911-13, and in consequence the index falls from 98 to 97. At 19s. 7d. per 120, quotations for eggs were the same as a month ago; here, again, on account of the considerable rise in the base prices, the latest index moves downwards by 30 points to 111. Cheese averaged £4 os. 6d. per cwt. as against £3 15s. in October, and the index at 107 is higher by 6 points. Most descriptions of poultry also made more money, the combined index advancing from 115 to 116.

Other Commodities. At £7 8s. 6d. per ton, potatoes showed an increase in price of 3s. and the index at 209 compares with 202 recorded for the previous month. Quotations for hay were little altered and the combined index continues

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unchanged at 102. At 1s. 1 $\frac{7}{8}$ d. per lb. wool rose by $\frac{1}{8}$ d., the index of 107 being higher by 5 points.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934	1935	1936			
	Nov	Nov	Aug.	Sept.	Oct.	Nov.
Wheat	66	78	96	98	113	114
Barley	104	101	100	124	119	115
Oats	94	87	98	98	99	98
Fat cattle	96	92	102	98	95	93
„ sheep	123	120	128	131	131	130
Bacon pigs ..	103	93	111	111	114	118
Pork „	118	103	107	109	119	126
Eggs	111	109	130	124	141	111
Poultry	114	118	113	113	115	116
Milk	161	171	175	202	171	171
Butter	83	97	100	98	98	97
Cheese	93	87	113	106	101	107
Potatoes	146	160	109	149	202	209
Hay	104	84	98	105	102	102
Wool	85	91	95	100	102	107
Dairy cows ..	105	103	103	103	107	109
Store cattle ..	83	90	101	97	95	95
„ sheep	107	112	126	132	132	117
„ pigs	147	129	133	138	150	155

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act

Wheat	116	121*	122	130	131	130
Fat cattle ..	110	106	117	113	109	108
General Index ..	120	119	124	133	129	129

* Superseding figure previously published.

Wart Disease Immunity Trials, 1937

THE Ministry will continue during the coming season to test, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, potatoes and potato seedlings as to their immunity from or susceptibility to Wart Disease on the conditions stated below.

The entry form (No. 345 H.D.), obtainable from the Ministry, should be filled up and returned to the Potato Testing Station, Ormskirk, Lancs, *with the requisite fees*. Samples must be sent to that Station *as early as possible, but in any case not later than March 6*.

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Potatoes are accepted from *English, Scottish and Irish growers* for trial under the following conditions:—

(a) Quantity of each stock of potato to be sent for the first time—50 seed size tubers.

Quantity of each stock of potato to be sent for the second and for subsequent years—35 seed size tubers.

(b) Fees on the following scale are payable in respect of each stock of potato when first entered for immunity trials:—

Less than 5 samples from one grower, 10s. per sample.

5 samples or more from one grower 8s. per sample up to 20, and 6s. for each sample in excess of 20.

These fees are not returnable under any circumstances.

(c) The Ministry, while taking reasonable precautions to secure satisfactory growth, can accept no responsibility for the failure of any variety.

(d) The Ministry will take all reasonable precautions to secure that all the produce of the trial plots is fed to stock after being thoroughly mixed together, except such portions as may be needed for exhibition or scientific purposes authorized by the Ministry. The Ministry, however, reserves the right to send tubers from the produce grown at Ormskirk for testing at the official stations of the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

(e) All stocks entered for the trials will be tested both in the laboratory and in the field. When the Ministry is satisfied as a result of the trials that a variety is immune from Wart Disease, it will formally "approve" the variety and will issue an official certificate of immunity. Such certificates will not be issued until the variety has been named and until an assurance has been received from the sender that it has been, or is about to be, introduced into commerce. *When a variety tested under a number or letter has been subsequently named and "approved," a sample of 100 tubers of the variety as named must be sent to Ormskirk for comparison with the tested stock.* No certificate will be issued for any new variety until it has passed at least two consecutive years' tests without contracting the disease and has been declared by the Synonym Committee of the National Institute of Agricultural Botany to be distinct from existing varieties.

Potatoes are accepted *from foreign growers* on the conditions (a) to (d) set out above, but no foreign variety will be formally "approved" and no certificate will be issued until the variety is definitely introduced into commerce in Great Britain.

Trials of Seedlings. The Ministry desires to encourage the breeding of new varieties of potatoes, and in order to provide information for breeders of seedlings it is prepared to accept not fewer than two tubers, and not more than ten tubers, of any seedlings for testing in the laboratory and growing for one season on the trial plots, and to furnish a report on the results obtained, without payment of a fee. These tests, however, will not be considered as forming part of the Immunity Trials proper, and will not be reckoned in the minimum

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period of two years referred to under (e). The results of these tests will not be included in any report issued by the Ministry.

GENERAL INSTRUCTIONS: Carriage.—Small consignments should be sent by passenger train, carriage paid, or by parcel post; larger consignments should be forwarded by goods train, carriage paid.

Labels.—All consignments should be distinctly labelled. A label bearing the name and address of the sender and name of variety or seedling number should be firmly tied to the bag; in addition a similar label should be placed inside the bag.

Address.—All consignments should be addressed to:—

THE SUPERINTENDENT,
POTATO TESTING STATION,
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY,
ORMSKIRK, LANCs.

Station: Ormskirk, L.M. & S. Railway.

Date of Forwarding.—Consignments should be sent so as to reach the Testing Station as early as possible, and in any case not later than March 6.

Advisory Leaflets

SINCE the date of the list published in the August, 1936, issue of this JOURNAL (p. 421), the undermentioned Advisory Leaflets have been issued by the Ministry:—

- No. 67.—The Cultivation of Lucerne (Revised).
- No. 78.—Gapes in Poultry (Revised).
- No. 100.—Apple Canker (Revised).
- No. 195.—The Diamond-Back Moth (Revised).
- No. 272.—Fowl Paralysis.
- No. 273.—American Gooseberry Mildew.
- No. 274.—Wart Disease of Potatoes.
- No. 275.—Stomach Worms in Sheep.
- No. 276.—Club Root.
- No. 278.—Potato Leaf-Roll.

Copies of any of the above-mentioned leaflets may be purchased from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Sale Offices of that Department at Edinburgh, Manchester, Cardiff and Belfast, price 1d. each net (1½d. post free), or 9d. net per doz. (10d. post free).

Single copies of not more than 20 leaflets may, however, be obtained, free of charge, on application to the Ministry. Further copies beyond this limit must be purchased from H.M. Stationery Office, as above.

A list of the Ministry's publications, including leaflets, on agriculture and horticulture may be obtained free and post free on application to the Ministry.

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Agricultural Economics Society's Essay Competition

THE result of the Agricultural Economics Society's Essay Competition for 1935-36, of which particulars were given in the issue of this JOURNAL for August, 1935 (p. 424), has been announced. The First Prize of £10 has been withheld. The Second Prize of £5 has been awarded to Mr. W. F. Searle, B.Sc. (Econ.), of 10, Fladgate Road, Leytonstone, London, E.11, for his essay on "Trends of Production in British Agriculture."

Supplies of Canned and Dried Fruit, 1935*

THIS valuable annual summary of the supply statistics relating to canned and dried fruits, fruit pulp and canned vegetables, round off, in a handy form for reference, the weekly supplement and the monthly "Canned and Dried Fruit Notes" issued by the Imperial Economic Committee, which for a number of years have proved to be of real value to those interested in the United Kingdom's trade in canned and other types of processed fruits and vegetables. It contains a great deal of concise information, derived from various sources, which is not supplied by Board of Trade Returns. Tables are included showing the source of supply of imports, the quantities of the various products imported, the ports of arrival and of ultimate destination of the imports. These Tables are also an approximate guide as to local preferences for particular products.

Imports of canned and bottled fruits in 1935 created a record, being 184,600 tons of a declared value of £6,058,000, and the total quantity thus available for consumption per head of the population was 8.8 lb. or nearly 3 lb. greater than in 1930. Home production of canned and bottled fruits has increased at a greater rate during these five years, but is still relatively small, and represents only a consumption of about 1 lb. per head of the population over and above the consumption of imported goods. In recent years, Empire imports, consisting for the most part of fruits not produced in this country, have increased at the expense of canned products of foreign origin, but in 1935 they were somewhat lighter than in 1934,

* *Supplies of Canned and Dried Fruit, 1935.* Printed and published for the Imperial Economic Committee by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2s. 6d., post free 2s. 9d.

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the proportion declining from 43·8 to 38·6 per cent. of the total.

The imports of canned vegetables in 1935 are estimated at 1,245,000 cwt. as against 970,000 cwt. in 1934. The home production in 1934 was 1,022,000 cwt., but information as to the production in 1935 was not available. The bulk of imported vegetables consists of kinds, such as tomatoes, that are not produced on a competitive commercial scale in this country.

Agricultural Workers' Act, 1936, New Zealand

THE Agricultural Workers' Act, 1936, which came into force in New Zealand on October 1, 1936, supersedes and extends former enactments governing the provision of accommodation for agricultural workers, and as regards workers employed on dairy farms, provides for minimum wages at prescribed rates with an additional sum in cases where the employer does not provide board and lodging. After July 31, 1937, the minimum rates may, by Order in Council, be increased from time to time in the light of prices fixed for dairy produce under the Primary Products Marketing Act, 1936; when no such Order is in force the prescribed rates must be observed. Provision is also made for minimum holidays with full pay, together with one-half of the prescribed allowance for board and lodging. If a worker can establish that he is incapable by reason of infirmity, arising from old age or other cause, of earning the minimum rate of wage, he may be granted from time to time a permit to accept wages at such lower rate as may be specified in the permit. Although the minimum wage and holiday provisions at present apply only to workers on dairy farms, they may from time to time, by Order in Council, be extended with necessary modifications to other classes of agricultural workers; before any such Order is made, however, organizations representing employers and workers must be consulted. Other provisions relate to the prohibition of the employment of children under the age of 15 on dairy farms and the keeping of wages and holiday records by employers. The Department of Labour is responsible for the administration of the Act, and local supervision is undertaken by inspectors whose powers and duties are defined.

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Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, December 15, 1936, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Berkshire.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 32s. (instead of 31s. as at present) per week of 50 hours, except in the weeks in which Good Friday, Coronation Day, Whit Monday and Christmas Day fall when the hours are 41, with overtime at 9½d. per hour (instead of 9d. per hour as at present). The minimum rate for female workers of 19 years of age and over is unchanged at 5d. per hour for all time worked.

Buckinghamshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into force on December 20, 1936, and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 33s. (instead of 32s. as at present) per week of 50 hours in summer, except in the weeks in which Easter Monday, Coronation Day and Whit Monday fall when the hours are 41, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall when the hours are 31. The overtime rates are 10d. per hour on weekdays (instead of 9d. per hour as at present) and 1s. per hour on Sundays, Easter Monday, Coronation Day, Whit Monday, Christmas Day and Boxing Day (instead of 11d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day as at present). The minimum rates for female workers of 18 years of age and over are 7d. per hour (instead of 6½d. per hour as at present) with overtime at 8½d. per hour on weekdays (instead of 7½d. as at present) and 10d. per hour on Sundays, Easter Monday, Whit Monday, Coronation Day, Christmas Day and Boxing Day (instead of 9d. per hour on Sundays, Easter Monday, Whit Monday, Christmas Day and Boxing Day as at present).

Derbyshire.—(1) An Order fixing minimum and overtime rates of wages to come into force on December 26, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 25, 1937. The minimum rate for male workers of 21 years of age and over is 8d. per hour. For whole-time workers provision is made for payment at not less than 36s. per week of 54 hours, except in the weeks in which Good Friday, Easter Monday, Christmas Day and Boxing Day fall when the hours are 45. The overtime rates for adult male workers are 10d. per hour on Sundays and 9d. per hour for employment on Good Friday, Easter Monday, Christmas Day and Boxing Day (instead of 10d. per hour for all overtime employment, i.e., on Sundays, as at present). The rates for female workers of 18 years of age and over are unchanged at 5d. per hour with payment for overtime (i.e., employment on Sundays) at 8d. per hour.

(2) An Order fixing special differential rates of wages for male workers of 18 years of age and over for overtime employment on the hay and corn harvests of 1937. The rate for male workers of 21 years of age and over is 9d. per hour.

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Hampshire and Isle of Wight.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 3s. (as at present) per week of 51 hours in summer, except in the weeks in which Good Friday, Easter Monday, Coronation Day, Whit Monday and August Bank Holiday fall when the hours are 41½, and 48 hours in winter, except in the weeks in which Christmas Day and Boxing Day fall when the hours are 40. The overtime rates are unchanged at 9d. per hour throughout the year, except in the case of carters, cowmen, shepherds and milkers for work in connexion with the immediate care of animals in which case the overtime rate is 8d. per hour. The minimum rate for female workers of 18 years of age and over remains unchanged at 5d. per hour for all time worked.

Norfolk.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 25, 1937. The minimum rates are for workers of 21 years of age and over 3s. 6d. (instead of 3s. 6d. as at present) per week of 50 hours in summer, except in the week in which Good Friday falls when the hours are 42, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 40, with in addition in the case of workers employed as teamsmen, cowmen, shepherds or yardmen, 5s. 6d. per week, and in the case of sheep tenders and bullock tenders 4s. 6d. per week in lieu of overtime in respect of work in connection with animals other than such work on Good Friday and Christmas Day in respect of which an additional sum of 5s. is payable except where a day's holiday on full pay is given in the weeks in which those holidays fall or in the weeks immediately following. The overtime rates for all male workers of 21 years of age and over are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rates for female workers of 18 years of age and over are 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays (as at present).

Nottinghamshire.—An Order varying the existing minimum and overtime rates of wages, the rates as varied to come into force on December 20, 1936. The minimum rates for male workers of 21 years of age and over are 3s. (as at present) per week of 50 hours, except in the weeks in which Christmas Day and Good Friday fall when the hours are 41 (instead of 50 hours throughout the year as at present) with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Christmas Day and Good Friday. Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Easter Monday and Boxing Day fall to meet cases where holidays are given in those weeks instead of in the weeks in which Good Friday and Christmas Day fall. For female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 8d. per hour.

Surrey.—An Order fixing minimum and overtime rates of wages to come into force on December 20, 1936 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until December 18, 1937. The minimum rates for skilled male workers (horsemen, stockmen and shepherds) of 21 years of age and over are

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40s. (instead of 38s. 8d. as at present) per week of 60 hours except in the weeks in which Christmas Day and Good Friday fall when the hours are 51. For other male workers (except casual workers) of 21 years of age and over the minimum rates are 33s. 4d. (instead of 32s. 3d. as at present) per week of 50 hours, except in the weeks in which Christmas Day and Good Friday fall when the hours are 41. In both cases provision is made for the payment of a minimum rate of wages in respect of a reduced number of hours in Easter week (instead of in the week in which Good Friday falls) if a holiday is given on Easter Monday in lieu of one on Good Friday. For casual male workers of 21 years of age and over the minimum rate is unchanged at 7½d. per hour. The overtime rates for all classes of adult male workers are unchanged at 9d. per hour on weekdays and 11d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate remains unchanged at 5½d. per hour with overtime at 7d. per hour on weekdays and 8d. per hour on Sundays.

Wiltshire.—An Order fixing minimum and overtime rates of wages to come into force on December 27, 1936 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until January 1, 1938. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 50 hours, except in the weeks in which Good Friday, Easter Monday, Coronation Day, Whit Monday and Christmas Day fall when the hours are 41. The overtime rates are 9d. per hour on weekdays (as at present) and 10d. per hour on Sundays, Good Friday, Easter Monday, Coronation Day, Whit Monday and Christmas Day (instead of Sundays, Good Friday and Christmas Day as at present). The rate for overtime employment on the hay and corn harvests on weekdays is 9d. per hour (as in 1936). The minimum rate for female workers of 18 years of age and over is 5d. per hour for all time worked (as at present).

Denbigh and Flint.—(1) An Order fixing minimum and overtime rates of wages for workers (other than male workers wholly or mainly employed in forestry) to come into force on February 16, 1937 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until February 15, 1938. The minimum rate for male workers of 21 years of age and over employed wholly or mainly as team-men, cattlemen, cowmen, shepherds or bailiffs is 36s. 6d. (instead of 35s. 6d. as at present) per week of 60 hours, and for other male workers except casual workers of 21 years of age and over 31s. (instead of 30s. 6d. as at present) per week of 48 hours in winter and 50 hours in summer. The overtime rate for male workers of 21 years of age and over, other than casual workers, remains unchanged at 9d. per hour. The minimum rate for casual male workers of 21 years of age and over is 8d. per hour (as at present) for all time worked, "casual employment" being "employment under a contract of service for a period of less than one week." For female workers of 18 years of age and over the minimum rates remain unchanged at 5d. per hour per week of 48 hours with overtime at 6½d. per hour.

(2) An Order fixing minimum and overtime rates of wages for male workers employed wholly or mainly in forestry, to come into force on February 16, 1937, and to continue in operation until February 15, 1938. The minimum rate for male workers of 21 years of age and over employed wholly or mainly in forestry is 36s. (instead of 35s. as at present) per week of 50 hours with overtime unchanged at 9d. per hour.

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Enforcement of Minimum Rates of Wages.—During the month ending December 12, 1936, legal proceedings were taken against ten employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Cheshire ..	Sandbach	0 10 0	0 5 0	66 14 10	2
Derby ..	Swadlincote	1 0 0	0 2 6	20 0 0	1
Lancs ..	Blackburn	*	2 15 0	18 0 0	1
" ..	Rochdale	5 0 0	0 2 0	11 13 4	1
Stafford ..	Lichfield ..	10 0 0	—	60 0 0	1
" ..	Eccleshall	2 0 0	0 4 0	17 0 0	2
Yorks (E.R.)	Hull ..	10 0 0	0 1 0	16 2 8	1
" (W.R.)	Barnsley	10 0 0	3 3 0	27 6 3	1
Glamorgan..	Bridgend..	5 0 0	2 4 6	29 6 3	1
Pembroke ..	Haverford-west	1 0 0	—	5 16 2	1
		44 10 0	8 17 0	271 19 6	12

* Dismissed under the Probation of Offenders Act.

Foot-and-Mouth Disease.—No further outbreak occurred in the Idless, Truro, Cornwall, Infected Area and the area was released from restrictions on December 10.

A fresh outbreak at Sealand, Chester, was confirmed on November 27 and restrictions were imposed over an area extending approximately five miles round the infected premises. As the disease position in this locality remained satisfactory, the area was reduced to approximately two miles round the infected premises on December 12 and restrictions were finally removed on December 19.

Thirty-two further outbreaks were confirmed in the Cheshire and Derbyshire Infected Area between November 28 and December 28, making a total of 35 outbreaks in this Area since the initial outbreak was confirmed at Bosley on November 23. In addition, there was a further case of disease on premises at Flagg, Buxton, on which disease had previously been confirmed. In consequence of outbreaks at South Wingfield, Derby, on November 28, at Aston-by-Budworth on November 30, and at Belper, Derby, on December 8, it was necessary to extend the original Infected Area, but on December 15 this Area was reduced to three smaller and separate areas, extending approximately five miles round Aston, five miles round Bosley, and 15 miles round Bakewell. The Bosley and the Aston Areas were finally released from restrictions on December 18 and December 22 respectively. The Bakewell Area has been contracted in successive stages until, on December 28, it comprised an area of approximately five miles round the infected premises at Chelmorton, Monyash, Youghreave, Barlow, South Wingfield and Belper. A further contraction to five miles round Monyash, Youghreave and Flagg will come into operation on January 14, 1937, by Order issued on December 30, 1936.

Outbreaks were confirmed at South Leverton, Retford, Notts, on November 29, and at Laneham, Retford, on December 1. Restrictions were imposed over an area having a radius of 15 miles round the Infected

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place at South Leverton on November 29, and, as the disease position remained satisfactory after the Laneham outbreak, this Area was reduced to one of a radius of approximately five miles round the two Infected premises on December 15. The restrictions were finally removed on December 23.

Outbreaks were also confirmed at Newstead Abbey, Nottingham, on December 10, at Newton Regis, Tamworth, Warwick, on December 12, 19 and 27, and at Lichfield on December 14. The usual restrictions were imposed over areas of approximately 15 miles round Newstead Abbey and Newton Regis.

The Newstead area was contracted to an area of approximately five miles radius round the Infected premises on December 25, and will be released from restrictions on January 1, 1937. The Newton Regis area was contracted to one of approximately five miles round the Infected premises at Newton Regis and Lichfield on December 27, and will be further contracted on January five to approximately five miles round Newton Regis.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Cheshire: Miss D. M. Phillips, B.Sc., N.D.D., has been appointed Assistant Instructor in Dairying, *vice* Miss E. L. Coleman, N.D.D., B.D.F.D.

Gloucestershire: Mr. B. J. Fricker, N.D.A., N.D.D., B.D.F.D., has been appointed Agricultural Organizer, *vice* Mr. E. Rea, N.D.A., N.D.D., and will take up his duties on February 1, 1937.

Hampshire: Mr. R. A. Johnson has been appointed Manager of Egg-laying Trials, *vice* Mr. N. F. Smith.

Mr. J. A. Wyatt, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Assistant Dairy Officer, *vice* Mr. J. A. Duncan, B.Sc. (Agric.), N.D.A., N.D.D.

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The Marketing of Australian and New Zealand Primary Products. By W. Millar Smith, M.A., B.Com. (N.Z.), Ph.D. (Econ.) (Lond.), F.S.S. Pp. xvii + 352. (London: Sir Isaac Pitman & Sons, Ltd. 1936. Price 12s. 6d. net.)

This book covers a very wide field, embracing the history of organized marketing in Australia and New Zealand in both its practical and legal aspects. The methods of marketing wool, wheat, dairy produce and meat are dealt with in considerable detail, while the section on the Australian Constitution and inter-State trade is of particular value at the present time. The work is not only descriptive; it exposes the economic principles that condition the practical measures which have been taken.

Dr. Smith points out that the securing of specially-protected prices for one agricultural commodity after another has tended to depress more and more the prices of non-controlled goods, on which the burden of the artificial economy falls. He suggests that the export control boards generally do not display much interest in promoting adequate reforms in marketing methods, and he argues that much of the work of the export boards, such as freight and insurance contracts and advertising, might be undertaken by a single export trades commission set up in each Dominion on the lines of the Perishable Products Export Control Board set up in South Africa in 1926.

A long chapter is devoted to the problem of maximizing returns to producers, and the future prospects of various lines of marketing policy are considered. The author is convinced that it will be necessary to go forward with the large-scale organization of farming, but he points out

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that this development brings an increasing need for social control. Co-ordinating or directive bodies will fail if they do not take a broad enough view of their duties, particularly as regards the service they offer to consumers; farm profits can no longer be regarded as the sole criterion of agricultural marketing policy.

This scholarly work, as Professor Coatman suggests in his Foreword, will be of particular value to all who are interested not only in the working of the Ottawa Agreements but in their probable readjustment from time to time; the book will, of course, also benefit all who are concerned at any stage in the marketing of the primary produce of Australia and New Zealand.

Plantation Crops. Pp. 78. (London: H.M. Stationery Office. 1936. Price 2s. 6d.)

The title of this review recalls the time when sugar, tea, coffee, cocoa, spices, tobacco and rubber were produced principally or entirely by planters, and, although to-day only a few of these commodities are still plantation crops in the old sense, the traditional title has been retained by the Imperial Economic Committee which issues this summary of figures of production and trade relating to these crops. It is gratifying to note that the United Kingdom tends to rely increasingly on Empire sources for its supplies of these products.

Pigs: Hints on Breeding, Feeding and Management. Pp. 57. Illustrated. (London: National Pig Breeders' Association, Victoria House, Southampton Row, W.C.1. 1936. Price 1s.)

A section of this brochure consists of a useful series of articles "for beginners" (and others), contributed by Mr. J. W. Reid, Vice-Principal of the Hertfordshire Institute of Agriculture. The important subject of pedigree is dealt with in a paper by the late Mr. Leopold C. Paget, and there is a chapter on "Common Ailments of Pigs" by Major C. G. Saunders.

Correspondance Économique Roumaine. Quarterly Journal of the Roumanian Ministry of Trade and Industry. Vol. 18, No. 2, April-June, 1936. (Bucarest: The State Printing Office. Price 200 lei.)

This issue of the Quarterly Journal of the Ministry of Trade and Industry of Roumania, published in French and English, contains a full account of the development of the beet-sugar industry in that country, by two officers of the Ministry, M. Georges Ioanitziu and Dr. Calmuschi. The article opens with a brief general history of the sugar industry in the world up to the formation of the international committee last year. An account is then given of the efforts of the Roumanian Government to encourage the growth of the sugar-beet industry following the establishment of two factories in 1875 as a result of a law of 1873 granting duty exemption. For a short period following the War, the sugar factories received no special assistance, but tariff protection was soon restored and Government control has since steadily increased. The industry now works under a law of April 13, 1933, which is reprinted in full. Before the War, four factories were in operation, but, with the addition of the factories acquired with new territories after the War, Roumania now possesses 15 factories. The report includes a brief description of the technical equipment of the factories and the financial resources of the operating companies. The operation of the post-war legislation is explained in detail and full supporting statistics are quoted with regard to such matters as production, consumption, taxes, prices.

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Wool Production and Trade, 1935-1936. A Supplement to "Wool Intelligence Notes" prepared in the Intelligence Branch of the Imperial Economic Committee. Pp. 78. (London: His Majesty's Stationery Office. 1936. Price 2s. 6d.).

The main conclusion that emerges from this informative compilation is that wool-prices during the past season were steadily and considerably above those of the previous season, despite various economic and political disturbances. Prices showed a rising tendency until March-April, after which there was a slight reaction, followed by a recovery in July and August. The statistical position of the commodity at the close of the season in June was very satisfactory. Germany and Italy continued to restrict imports and to encourage domestic production, but the reduced purchases by these countries were balanced by the increased requirements of Japan and the United States. The United Kingdom, the world's largest wool consumer, maintained its interest in all markets. In South America, both Argentina and Uruguay appointed Government Commissions to supervise and assist the sheep-raising industry.

Refrigeration for the Farm and Dairy. By C. A. Cameron Brown, B.Sc., A.M.I.E.E. Pp. 51. (Oxford: Institute for Research in Agricultural Engineering, Parks Road. 1936. Price 1s. 6d.)

This brochure gives an excellent account of the principles of refrigeration and their application to the farm and dairy. Progressive dairymen will find here, clearly set forth, information that will be of material value to them in their business. The information will also be useful to agriculturists who desire to understand the basis of this important process. The compression and absorption systems of refrigeration are treated non-technically and illustrated by simple diagrams. The merits of direct expansion cooling as compared with artificial cooling, are discussed from a practical standpoint, and a note on the steam sterilization of the equipment is included. A cold storage section describes the essentials of the construction and operation of an insulated chamber, including the problem of defrosting. Costs of such equipment and its maintenance are indicated by working examples. There are useful notes on portable cooling devices involving the use of solid carbon dioxide, and careful explanations of the so-called "gas-storage" system of fresh fruit preservation, and the significance of successful cold storage on the development of marketing schemes for such things as lettuce and other perishable market garden produce. The pre-cooling and short period storage of poultry carcasses and the cold storage of eggs, are also dealt with informatively. The brochure is altogether instructive, useful to food producers and distributors alike.

A Survey of the Agricultural and Waste Lands of Wales. Edited for the Cahn Hill Improvement Scheme by R. G. Stapledon, C.B.E. Pp. xv + 143. 8 Figs. and 1 Map. (London: Faber & Faber, Ltd. 1936. Price 15s.)

Most of the readers of this JOURNAL will be acquainted with Professor Stapledon's now famous book "The Land, Now and To-morrow," and with the ideas he expounded in it. The present volume is a detailed study of the grass lands of Wales, and provides evidence of a decisive character in support of the contentions which he made in his previous book, and which have already received general agreement.

The present survey shows that a very large proportion of the grass lands of Wales is little better than in a state of nature. It might almost be said that these areas are worse than in a state of nature, because events have taken place which have reduced their fertility and consequent feeding value.

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Unless strong measures are taken the remaining fertility and feeding value of these large areas will progress in a declining scale until they are completely useless for any human purpose. This conclusion is an inevitable result of reading Mr. Davies' survey, and is emphasized in Professor Stapledon's introduction.

Although this may sound as if the situation were desperate, the writers have no hesitation in pointing out that it can be readily made hopeful. The reclamation of this land is a simple matter; how it can be done is well known: all that is necessary is to do it in order to increase the value of the land itself and its capacity for food production. Not only is this of value in itself, but it also has wide implications, social and economic, that should be given the very gravest consideration.

The whole book is written by realists, the work was done by realists; there is nothing in the nature of wild theory behind their statements, and very complete evidence of their rational attitude of mind is supplied in the whole tone of the book; but a particularly good example is that where they describe how rushes spread.

"In our humid climate rushes can grow on quite dry land. Given the opportunity they will become established on normal soils, and if the pasture is starved of nutrients or if the grazing management is bad, then rushes already established will tend to become competitive and will spread. Being relatively unpalatable to stock, the rushes are further helped to spread in relation to the remainder of the herbage because they are normally not grazed by stock. Rushes are, in fact, quite sensitive to cutting or grazing just as are other plants. Measures to control them by means of the grazing animal and the mowing machine can therefore be employed."

The control of this weed is therefore a simple matter, and improvement of the botanical composition of most of the pastures described must be equally simple—it is only to be hoped that this book will stimulate its doing.

The Weekly Weather Report (March 3, 1935, to February 3, 1936.) Vol.

LII. Pp. 72. (London: His Majesty's Stationery Office. Price 7s. 6d., post free, 7s. 8d.)

This publication, issued by the Meteorological Office, contains data relating to temperature, rainfall and sunshine for each week in the twelve months from the beginning of spring, 1935, to the end of the following winter period. The tables are arranged so that the whole sequence of data (with differences from the average) for a single station occupy one page. The principal tables give data in this form for 57 selected stations, well distributed over the British Isles. Other tables show the average values for the twelve climatological districts of the British Isles and the difference from average in each week and in each of the four seasons. Rainfall was in excess of the average in all districts except South Ireland, the excess ranging from 3 per cent. in North Ireland to 33 per cent. in South-East England. In most districts sunshine was also in excess of the average, though there was a deficiency of 5 per cent. in South-West England and South Wales, and the Channel Islands. Mean temperature was above the average in England and South Ireland, but in Scotland and North Ireland it was slightly below.

The Agricultural Landowner's Handbook on Taxation. Fifth Edition, revised and enlarged by R. Strachan Gardiner, F.S.I., F.L.A.S. Pp. 251. (London: Central Landowners' Association, 7, Charles Street, S.W.1. 1936. Price 6s.)

Apart from the usual periodical revision to keep abreast of changes in land taxation, a new edition of this handbook has been necessitated by the passing of the Tithe Act, 1936. The chapter on tithe rentcharge has been

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enlarged to include a comprehensive summary of the Act, and information has been added concerning stamp duties, licence duties and national insurance contributions. As Lord Clinton points out in his introduction, the book will serve as a useful guide for those whose constant duty it is to translate legislation, departmental rulings and High Court decisions into the practice of estate management.

Young Farmers. Pp. 32. Illus. (London : National Federation of Young Farmers' Clubs, 16, Russell Square, W.C.1. 1936. Price 9d.)

This interesting and attractive brochure is profusely illustrated, and gives a very readable account of the aims and objects of the Club movement. Each aspect of the Clubs' activities, which include the care of animals, stock judging and various forms of study and recreation, is illustrated by numerous photographs, with short explanatory notes. At the end of the booklet there is a short history of the National Federation and of the movement generally. This publication can be strongly recommended to those who wish to obtain a bird's-eye view of the scope and purpose of a movement that is gaining increasing support up and down the country.

Milk and Milk Products. By C. H. Eckles, D.Sc., W. B. Combs, M.A., and H. Macy, Ph.D. Pp. xiii + 386 and 92 Figs. Second Edition. (London : McGraw-Hill Publishing Co., Ltd. 1936. Price 21s.)

This American manual will be of use to students preparing for technical examinations in dairying, and should also find a place in the offices of dairy managers, analysts and foremen engaged in milk factories. The subject-matter consists of a fairly comprehensive survey of the nature and properties of cows' milk, separate sections dealing with the manufacture of butter, cheese, condensed and dried milks and ice cream. Special chapters on the testing of milk and on microbiology are included. No attempt has been made to cover the entire field of dairying; the processes of milk secretion, and extraction, and indeed of milk production in general, are specifically excluded from consideration. The fundamental importance of the health of the dairy cow in determining the quality of milk, is mentioned in the text, but more emphasis might have been placed on the value of routine veterinary inspection in this connexion. A notable omission is the absence of any reference to the phosphatase test, in use nowadays for ascertaining the efficiency or otherwise of the pasteurization process. The use of chemicals for sterilizing dairy utensils is advocated, although preference is given to steam or boiling water. This well-bound volume is excellently printed on good quality paper, and provided with appropriate illustrations.

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- Brown, I.*—The Heart of England. (viii + 120 pp. + 97 pp. plates.) London: Batsford, 1935, 7s. 6d.
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Tree Injection, 1935 Experiments. A Progress Report. *J. Hearman, B. F. G. Levy and W. A. Roach*. (Rep. E. Malling Res. Stn. (1935), pp. 137-141.)

Investigations of Frost Damage to Horticultural Crops, with suggestions for Future Work. *W. A. Bane*. (Rep. E. Malling Res. Stn. (1935), pp. 220-224.)

Spring Frosts at East Malling, 1915-35. *T. N. Hoblyn*. (Rep. E. Malling Res. Stn. (1935), pp. 124-130.)

Some Notes on One Year's Experience with a Gas Store. *A. C. Painter*. (Rep. E. Malling Res. Stn. (1935), pp. 213-219.)

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Live Stock, Poultry and Feeding

- Loss of Young Pigs: A Breeder's Experiences and his Solution. *A. Gruzelier*. (Pig Breed. Annu. 16 (1936-37), pp. 82-86.)
- Breeds of Sheep: Characteristics Described. *N. A. Bowman*. (J. Dept. Agric. Vict. 34, 5 (May, 1936), pp. 226-235.)
- The Relative Profitableness of Producing Bacon and Pork. *H. R. Davidson*. (Pig Breed. Annu. 16 (1936-37), pp. 31-39.)
- A Method for Judging Pork and Bacon Carcasses. *H. R. Davidson et al.* (Pig. Breed. Annu. 16 (1936-37), pp. 49-64.)
- Change in Market Receipts of Fat Cattle since the Introduction of the Subsidy. *R. P. Askew*. (Fm. Econ. (July, 1936), pp. 46-48.)
- Costs of Fattening Cattle. *J. H. Smith*. (Welsh J. Agric. 12 (Jan., 1936), pp. 113-120.)
- Studies on Reproduction in Cattle. Part II. The Influence of Environmental Factors on Reproduction. *J. Anderson*. (Emp. J. Exp. Agric. (July, 1936), pp. 197-207.)
- Mineral Metabolism in the Calf and the Addition of Inorganic Minerals to the Calf's Diet. *E. J. Sheehy, B. J. Senior*. (J. Dept. Agric., Irish Free State, 34, 1 (June, 1936), pp. 1-32.)
- Microscopic Examination of Cattle Foods. *S. T. Parkinson*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 9-23.)
- Miller's Offal as a Pig Food. *V. C. Fishwick*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 117-121.)
- The Feeding-Value of Pastures Sown with Different Strains of Grasses and Clovers. *L. I. Jones*. (Emp. J. Exp. Agric. (July, 1936), pp. 263-273.)
- Monthly Cash Receipts and Expenses on Eighteen Yorkshire Poultry Farms. *J. D. Nutt*. (Fm. Econ. (July, 1936), pp. 40-41.)
- Ten Years' Result of a Poultry Farm in Wales. *J. H. Smith*. (Welsh J. Agric. 12 (Jan., 1936), pp. 58-69.)

Dairying, etc.

- Present State of the Dairying Industry in the Various Countries.— (7) Denmark. *E. Gasser*. (Int. Rev. Agric. Mon. Bull. Agric. Sci. Pract. 27, 5 (May, 1936), pp. 189-196.)
- Biennial Reviews of the Progress of Dairy Science. Section D¹. The Nutritional Value of Milk and Milk Products. *S. K. Kon*. (J. Dairy Res. 7, 2, (May, 1936), pp. 192-210.)
- The Quantities of Grass that Dairy Cows will Graze. *T. E. Woodward*. (J. Dairy Sci. 19, 6 (June, 1936), pp. 347-357.)
- Food Costs in Relation to Milk Yield. *A. L. Jolly*. (J. S.-E. Agric. Coll., Wye (July, 1936), pp. 108-113.)
- The Trend of Milk Prices in the Eastern Counties. *P. E. Graves*. (Fm. Econ. (July, 1936), pp. 44-46.)
- Giving the Consumer the Manufacturing Milk. *S. M. Makings*. (Fm. Econ. (July, 1936), pp. 41-44.)
- Winter Food Requirements for Milk Production. *C. V. Dawe, J. E. Blundell*. (Fm. Econ. (July, 1936), pp. 38-39.)
- Some Costs of Manufacturing Milk in Welsh Factories. *W. H. Jones*. (Welsh J. Agric. 12 (Jan. 1936), pp. 97-112.)
- The Titration of Milk and Whey as a Means of Estimating the Colloidal Calcium Phosphate of Milk. *E. R. Ling*. (J. Dairy Res., 7, 2 (May, 1936), pp. 145-155.)
- Influence of Mastitis and of *Brucella Abortus* Infection upon the Milk Yield of Cows. *F. C. Minett and W. J. Martin*. (J. Dairy Res. 7, 2 (May, 1936), pp. 122-144.)

SELECTED CONTENTS OF PERIODICALS

- The Value of Artificially Dried Grass, Silage made with added Molasses and A.I.V. Fodder in the Diet of the Dairy Cow and their Effect on the Quality of the Milk, with Special Reference to the Value of the non-Protein Nitrogen. *S. J. Watson and W. S. Ferguson.* (J. Agric. Sci. 26, 3 (July, 1936), pp. 337-367.)
- The Influence of Storage, Pasteurization, and Contamination with Metals on the Stability of Vitamin C in Milk. *C. H. Whitnah, W. H. Riddell and W. J. Caulfield.* (J. Dairy Sci. 19, 6 (June, 1936), pp. 373-383.)
- The Reduction of Methylene Blue at 15.5° C. (60° F.) as a Test of Keeping Quality of Milk. *A. L. Provan, F. J. Dudley and S. B. Thomas.* (Welsh J. Agric. 12 (Jan., 1936), pp. 130-135.)
- The Nutritive Value of Proteins for Milk Production. IV. A comparison of the Proteins of (a) Spring and Autumn Grass, (b) Grass conserved as silage (A.I.V. Acid treated, Molasses treated and ordinary untreated) and (c) Grass conserved by drying, with Notes on (i) the effect of heat treatment on the Nutritive Value, and (ii) the supplementary relations of Food Proteins. *S. Morris, N. C. Wright and A. B. Fowler.* (J. Dairy Res. 7, 2 (May, 1936), pp. 97-121.)
- Studies on the Chemistry of Cheddar Cheese Making. IV. Lactose and Lactic Acid in Whey and Curd: the presence of bound water in Curd; the Existence of a Donnan Equilibrium between curd and whey; and the rate of penetration of salt into curd. *F. H. McDowall and R. M. Dolby.* (J. Dairy Res. 7, 2 (May, 1936), pp. 156-175.)

Veterinary Science and Nutrition

- Chronic Progressive Pneumonia of Sheep, with Particular Reference to its Etiology and Transmission. *G. T. Creech and W. S. Gochenour.* (J. Agric. Res. 52, 9 (May 1, 1936), pp. 667-679.)
- The Gapeworm Problem. *T. I. Davies.* (Welsh J. Agric. 12 (Jan. 1936), pp. 205-209.)
- The Estimation of the Heat Production of Cattle from the Insensible Loss in Body Weight. *H. H. Mitchell, T. S. Hamilton.* (J. Agric. Res. 52, 11 (June, 1936), pp. 837-854.)
- The Mechanical Aspect of the Nutrition of Farm Stock. *E. J. Sheehy.* (Sci. Proc. Roy. Dublin Soc. 21 (New Series), 29 (July, 1936), pp. 257-280.)

Food Preservation, etc.

- Progress in the World's Food-Canning Industry. (Bull. Int. Tin Res. and Dev. Council. (Feb., 1935), pp. 4-10.)
- The Development of the British Canning Industry. (Bull. Int. Tin Res. and Dev. Council. (Feb., 1935), pp. 11-27.)
- Investigations on Fruit Products. V. The Concentration of Fruit Juices by Freezing, with Special Reference to Apple Juice. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 150-161.)
- Investigations on Fruit Products. VI. Fruit Syrups. A. Production of Fruit Syrups. B. Use of Pure Fruit Syrups in Milk Beverages. *V. L. S. Charley.* (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 162-183.)
- Investigations on Fruit Products. VIII. Production of Fruit Wines. A. The Effects of (a) Dilution of the Juice, and (b) the Addition of Press Cake. B. The Effects of (a) Type of Sugar, and (b) Type of Yeast used for Fermentation. C. Yeast Nutrition in Fruit

WIRELESS TALKS TO FARMERS

Wines. Progress Report. *V. L. S. Charley*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 192-216).
 Low Temperature Keeping of Cider. *V. L. S. Charley*. (Ann. Rep. Agric. and Hort. Res. Stn., Long Ashton (1935), pp. 138-144.)

WIRELESS TALKS TO FARMERS, JANUARY, 1937

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National :			
January 4	6.20	Mr. Anthony Hurd	Sheep.
" 11	6.20	Mr. Anthony Hurd (with another speaker)	Pedigree Stock.
" 18	6.20	Mr. Anthony Hurd	Fruit.
" 25	6.20	Mr. Anthony Hurd	
Midland :			
January 14	6.40	Mr. H. G. Robinson	For Midland Farmers.
North :			
January 1	6.40	Prof. J. A. Hanley	Store Cattle breeding and rearing in Cumberland, Westmorland and Durham.
" 8	6.40	Mr. W. S. Shewell-Cooper	New Year Resolutions for Northern Gardeners.
" 14	6.40	Mr. A. McVicar	Employment of Power on the Small Farm.
" 29	Not fixed	Prof. J. A. Hanley and Mr. W. B. Mercer	Grass Production and Utilization.
Scottish :			
January 6	6.40	Rt. Hon. Walter Elliott	For Scottish Farmers.
" 14	6.35	Mr. Allan Fraser	For Scottish Farmers.
" 22	6.40	Mr. J. E. Wilson interviewed by Mr. W. J. Wright	Powl Paralysis.
Western :			
January 7	6.30	Not Settled	For Western Farmers.
" 9	8.55	Messrs. John & Wilfred Eley	Handing down from "Father to Son" in farming.
" 11	9.30	Messrs. P. B. Beer, F. C. James, and G. Sutton	Plough Monday.
" 14	6.40	Not Settled	For Western Farmers.
" 19	8.45	A Research Worker, a County Horticultural Superintendent, and a Railway Official, introduced by Mr. A. W. Ling	Flower Growing in the West.
Wales :			
January 7	9. 5	Mr. Tom Jones	Clearing Old Orchards.
" 8	7.30	Messrs. Moses Griffith, T. H. Parry and R. T. Vaughan	Mountain Sheep and Shepherding.
Northern Ireland :			
January 1, 15	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
" 8	8. 0	Mr. N. R. Knowles	The Bacteriologist and the Control of Dairying problems.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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NOTES FOR THE MONTH

International Grass Land Congress, July, 1937

THE Fourth International Grass Land Congress will take place in this country next July under the presidency of Professor R. G. Stapledon, Director of the Welsh Plant Breeding Station and the Imperial Bureau for Plant Genetics (Herbage Plants), Aberystwyth. Previous Congresses in this series have been held in Germany in 1927, in Sweden and Denmark in 1930, and in Switzerland in 1934. At the forthcoming Congress delegates are expected from all the more important European and American states, from the Dominions and Colonies, as well as from other countries throughout the world.

The paper-reading sessions will be held in Aberystwyth from July 13 to 19, and will consist of three plenary and two sectional sessions. Before and after the sessions tours will be made to centres of grassland interest, including the Cahn Hill Improvement Scheme, the experimental station at Cockle Park, Northumberland, and selected colleges, farm institutes and experimental stations. The tours have been so arranged that participants may have an opportunity of inspecting British grassland farming, including live stock management, over as wide a range as possible.

The sectionalized sessions will deal with the following aspects of the subject under discussion: (i) Ecology (including surveys), pasture and range management (including erosion control); (ii) Seeds mixtures (including lucerne for grazing), and legumes for use in poor pastures; (iii) Plant breeding, genetics and seed production; (iv) Manures and fertilizers; (v) Nutritive value of pastures, and fodder conservation; (vi) Grassland economics.

The following options will be available for delegates: (i) Attending paper-reading sessions and local Aberystwyth tours only, July 13-19; (ii) Assembling at Oxford, proceeding via selected centres of grassland interest to Aberystwyth, and participating in sessions and local tours, July 8-19;

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(iii) Attending paper-reading sessions and local tours, and proceeding from Aberystwyth to Newcastle and Edinburgh, where they will disperse, July 13-23; (iv) Assembling at Oxford, proceeding to Aberystwyth, attending paper-reading sessions and local tours, and proceeding thence to Edinburgh, i.e., the entire tour comprising options (i), (ii), and (iii).

Full particulars regarding terms of admission and accommodation, acceptance of papers and dates for receipt of abstracts and typescript of papers, may be obtained on application to The Joint Secretaries, Agricultural Buildings, Alexandra Road, Aberystwyth, to whom all communications concerning the Congress should be addressed.

The Cotton Collection of Bee-Keeping Books

THE Ministry's Library has recently acquired on loan the valuable collection of books on Bee-keeping made by the late Revd. W. C. Cotton, a well-known bee expert and writer on Bee-keeping in the middle of last century, and one of the founders and Vice-Presidents of the British Bee-keepers' Association.

Mr. Cotton, who is chiefly remembered for his work in connexion with Bee-keeping in New Zealand, was born in 1814 and died in 1879, and left his library in trust for the use of the Incumbent of the Living of Frodsham. The present incumbent, the Revd. Dr. M. W. Myres, has, after consultation with Mr. W. Herrod-Hempsall (the Ministry's Technical Adviser in Bee-keeping), and with the consent of the Chester Diocesan Registrar, arranged for this Collection, which contains over 200 works in English, French, and German, to be housed on loan in the Library of the Ministry, where it is available for consultation to all interested persons.

Garden Birds

THE Ministry issues a series of leaflets that deal with most species of birds* which are considered to be of special interest to the agriculturist. Other birds, however, although perhaps not of major importance, are worthy of mention, and it is proposed to discuss here the habits of a few species ordinarily associated with gardens and orchards.

Foremost among our garden birds are the blackbird and the

* The Ministry's bird leaflets, numbering 23, dealing with some 40 species of birds, have been combined in the form of a portfolio. Copies of the portfolio, which is bound in an attractive cover, may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 6d. each; post free 1s. 8d.

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song-thrush. In normal years both species are common in most cultivated areas, and at no time has either been reduced to anything like rarity in this country. This is so, in spite of the facts that both birds habitually build in exposed situations where their nests are easily seen, that hundreds of nests are destroyed annually by various means, and that their eggs are usually among the first acquisitions of the bird-nesting school-boy. It is true that both species rear two, or even three, broods in a season, but even so their continued abundance is a little surprising.

To consider the blackbird first; it may be said at once that this bird does a great deal of damage in the fruit season. It is very partial to cherries, and also to currants, gooseberries and other bush fruit. In many districts it is a decided nuisance in the fruit season, and most gardeners and fruit growers keep a wary eye on its activities. On the beneficial side, the blackbird destroys numbers of noxious insects, slugs, and other pests. It is one of our finest songsters, in the opinion of many people the best of them all; but even so it is to be feared that, on balance, this bird cannot be regarded as good for a garden or an orchard when fruit is ripe or ripening.

The habits of the song-thrush are to a certain extent similar to those of the blackbird. It is, however, much less prone to take fruit, and from a horticultural point of view is, on the whole, definitely a beneficial bird. It is very fond of snails, of which it eats large numbers. This habit alone should be enough to commend it to the gardener. As a singer it is inferior to the blackbird, but is by no means negligible in this respect.

The robin, one of the best known and most likeable of all our birds, may be placed high up in the list of beneficial species. The worst that can be said of it is that it occasionally takes a little fruit, and its feeding habits generally can result in nothing but good to the gardener and the fruit grower. It destroys many pests of orchard and garden—caterpillars and grubs of various kinds as well as winged insects. It also eats worms, slugs, and sometimes wild seeds and berries. It is one of the boldest and most confiding of our native birds, and is the subject of a good deal of superstition. It is probable that this last circumstance has no small part in securing its immunity from harm at the hand of man. It enjoys a popularity that is not achieved by any other British bird, and and no sensible person is likely to molest it.

The hedge-sparrow, a rather shy and retiring little bird,

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is common in most districts. Its title is a misnomer, since it is not related to the sparrows and is vastly different in physical structure and general appearance. Of all our garden birds the hedge-sparrow is, perhaps, the most blameless. So far as can be ascertained, it does no damage of any kind, but is, on the contrary, a highly beneficial bird and a desirable acquisition to any garden. Its food for the most part consists of insects of various kinds—aphides, beetles, sawflies and other winged pests, and their larvae. Wild seeds and berries are also included in its diet, and in the winter it is a frequent visitor to the bird table. It has a short but tuneful and pleasing song. Its nest and its beautiful blue, unspotted eggs are very well known to most country-folk.

The wren, a tiny bird whose appearance and demeanour have aptly been described as “perky,” is a general favourite with bird lovers. It, also, is a very beneficial bird, its food consisting mainly of insects and small garden pests generally. Its domed and cleverly constructed nest is found in all sorts of odd corners, and this bird seems to have a special aptitude for adapting its nest to the peculiarities of any situation in which it chooses to build. Care should always be taken when examining a wren’s nest, as the bird is apt to desert it on very little provocation. The song of the wren is musical and clear, and of a surprising volume for so small a bird.

The foregoing are the principal and commoner garden birds that are not included in the Ministry’s series of leaflets. There are, of course, many other species that visit gardens from time to time. Of these, mention may be made of the white-throat, lesser whitethroat, garden warbler, willow warbler, blackcap, nightingale, and chiffchaff. All of these are beneficial birds and should be welcomed by any owner of a garden or an orchard.

Village Halls : Extension of Facilities

It is common knowledge that for years past the National Council of Social Service (26, Bedford Square, London, W.C.1) have administered a Fund, provided by the Development Commission and the Carnegie United Kingdom Trust, to assist the building of Village Halls by means of loans and grants. Over 350 Halls have been built in this way at a total cost of about £300,000, of which £57,000 has been loaned to villages and repaid without a single default, and about £40,000 has been paid in grants voted by the Carnegie

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United Kingdom Trust. The National Council have recently issued the revised terms on which financial assistance can be obtained by villages for building Village Halls or for improving existing ones.

So far, only *loans* have been available for *improvement* of Village Halls, grants having been restricted to building only. In the future, however, owing to the generosity of the Carnegie United Kingdom Trust, improvement schemes will also be eligible for *grants*.

The type of scheme that will be eligible under this new provision may include extension of existing buildings, installation of heating, lighting or sanitary systems, and other improvements designed, for instance, to make a Hall more suitable for stage performances, physical training classes, or to meet the requirements of the licensing authorities. Generally speaking, the amount of grant allowable will be up to one-sixth of the cost, with a maximum of £75, and the amount of interest-free loan allowable will be up to one-third of the cost, with a maximum of £175. A rider to this arrangement is to the effect that in the case of small villages that have a population of less than 400 and find it difficult, if not impossible, to raise sufficient funds to build a Hall or to improve an existing one, the Trustees will agree to the proportion of grant aid being increased, possibly up to one-third of the cost of the scheme.

The National Council confidently hope that these additional facilities will enable villages to carry out many long-needed improvements to their Halls or, where a village has no Hall, will act as a source of encouragement to start a building scheme that will provide a Hall that will be a permanent addition to the amenities and beauty of the village.

International Congress of Agriculture at the Hague

THE XVIIth International Congress of Agriculture, organized by the International Agricultural Commission, will be held at The Hague next June, under the patronage of H.M. the Queen of the Netherlands. According to present arrangements the Congress will be officially opened on June 17, and will close on June 21. The subjects for discussion will include agricultural education, co-operation, live stock production, organization of the dairy industry, rural crafts and industries, rural economy, rural housing, vegetable cultivation, viticulture, and the place of women in

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agriculture. Membership will consist of members of the International Agricultural Commission, delegates from agricultural associations, technical or scientific institutes concerned with agriculture, and individual members. Full information regarding the Congress may be obtained from The Secretary, International Agricultural Commission, 18 rue de Bellechasse, Paris.

Dairy Produce

THIS publication* is one of the Imperial Economic Committee's valuable "Commodity Series," which provides in summary form the chief statistical data of world production and trade for the commodities concerned. The material is well set out and includes in a small space a vast amount of useful and interesting information. Dairy products resisted the depression longer than most other farm commodities, but prices declined until 1934, by which time they had fallen farther than agricultural produce in general. The prices of butter and cheese were halved between 1929 and 1934, but part of this fall has been recovered during the last two years. This recovery appears to be mainly due to the check to production in the Southern hemisphere, to the emergence of the United States of America as an importer, and to increased consumer demand. Egg prices fell much less severely than those of milk products.

During the last six years, butter consumption has been rising generally; in the United Kingdom the estimated *per capita* consumption was over 7 lb. higher in 1935 than in 1929. Consumption of butter is higher in British countries than in those foreign countries for which statistics are available but, on the other hand, European countries consume more cheese than any of the British Dominions or the United States. Canada, the Irish Free State, and the United States of America all consume well over two hundred eggs per head in a year, whereas the corresponding figure for the United Kingdom is 150, and for Germany 117.

International trade in butter has continued to increase between 1929 and 1935, although exports from European countries have declined. World trade in cheese declined by about one-fifth in the same period; Empire shipments of cheese were fairly well maintained until 1934, but since then have declined. International trade in eggs has been reduced

* *Dairy Produce : A Summary of Figures of Production.* Pp. 66. (London : His Majesty's Stationery Office. 1936: Price 2s. 6d.)

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even more sharply, the volume declining by over one-third between 1929 and 1935, while imports into the United Kingdom dropped by 20 per cent. during the same period. Two interesting Appendices are added, setting out the import duties and quantitative restrictions in force in various importing countries. In the second Appendix it is surprising to find Canada classified as a foreign country.

Market Supply Committee

THE Minister of Agriculture and Fisheries, the Secretary of State for Scotland, and the Secretary of State for Home Affairs, acting jointly, have appointed Mr. Francis Beattie and Mr. Geoffrey Peto, C.B.E., to be members of the Market Supply Committee, which was constituted under the Agricultural Marketing Act, 1933, to advise Ministers in connexion with arrangements for the regulation of imports of agricultural products into the United Kingdom. The other members of the Committee are Sir David Milne-Watson, Professor W. G. S. Adams, and Mr. Frank Hodges.

Sir David Milne-Watson has been appointed Chairman of the Committee in place of the Marquess of Linlithgow who resigned the post upon his appointment as Viceroy of India.

Mr. A. R. Manktelow has been appointed Secretary of the Committee in place of Mr. E. M. H. Lloyd, and the offices of the Committee have been moved to 7, Whitehall Place, London, S.W.1. All communications for the Committee should be sent to the Secretary at the foregoing address.

Colorado Beetle in Germany and Luxemburg

IN consequence of the spread of the Colorado Beetle into Germany and Luxemburg, the Minister of Agriculture and Fisheries made an Order—The Importation of Plants (Amendment No. 2) Order of 1936—which imposes restrictions on the importation into this country from Germany and Luxemburg of certain kinds of horticultural produce. Similar restrictions are already in force in the case of horticultural produce from France and Belgium. The new Order came into force on January 11, 1937.

The following is a summary of its provisions:

(a) A Colorado Beetle Certificate in one of two forms is required to accompany living plants, potatoes, raw vegetables, and cider apples imported from Germany or Luxemburg.

(b) The alternative forms of Colorado Beetle Certificate are (i) that the produce was grown outside a radius of

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50 kilometres from an outbreak, (ii) that the importation is permitted by a general licence granted by the Minister, and that the conditions laid down in the licence have been observed. Alternative (ii) is not applicable to potatoes.

Copies of the Order (S.R. & O. 1936, No. 1288), price 1d. each net, may be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Honey Research at Rothamsted

A substantial grant has recently been made to the Rothamsted Experimental Station to permit beekeeping researches to be broadened to include the investigation of various problems connected with honey. The appointment of Dr. C. R. Marshall to undertake this work has been approved, and Dr. Marshall recently took up his duties. In view of the fact that beekeepers during the past three years have contributed towards the cost of the brood disease investigations, the Government is bearing the whole cost of this new work.

The researches on honey will be physico-chemical in nature, and directed towards certain practical problems of quality and processing that affect the honey producer. Such problems are the granulation of honey, rapidity of granulation, texture of grain, "frosting," etc., and fermentation.

Dr. Marshall recently obtained the degree of Ph.D. at the University, Birmingham, where he has been working on chemical problems connected with the structure of mucilages.

International Annual of Agricultural Legislation

THE twenty-fifth issue of the *Annuaire International de Législation Agricole*,* just published by the International Institute of Agriculture, Rome, contains the most complete collection available of legislation dealing with finance and customs, plant and live stock production, land tenure and agricultural training, plant diseases and pests, agricultural co-operation, agricultural credit and insurance, rural ownership and internal settlement, legislation concerning the relations between capital and labour in agriculture, rural hygiene and the policing of the countryside. In the various chapters bearing the above headings are grouped the laws, orders, and regulations adopted on these subjects in all countries of the world. The most important provisions are reproduced in full, and for the others the title and complete references are given.

* Obtainable from the Institut International d'Agriculture, 1 Villa Umberto, Rome. Pp. lxxx + 926. Price 75 liras.

THE SECOND CONFERENCE ON MECHANIZED FARMING

THE Second Conference on Mechanized Farming was held at Rhodes House, Oxford, from January 5-8 inclusive. It was organized under the joint auspices of the School of Rural Economy, the Agricultural Economics Research Institute, and the Institute for Research in Agricultural Engineering in the same way as the First Conference last year (reported in this JOURNAL, February, 1936, pp. 1093-1107).

It is not too much to say that the Conference was an unqualified success. Not only was the attendance much larger than last year, but the papers led to enthusiastic and sometimes extremely critical discussion.

The papers read fall into 4 categories dealing respectively with Tractor Performance and Cultivation, the Maintenance of Fertility, Grass Drying, and the use of Combine Harvesters.

Tractor Performance and Cultivation. The paper on Tractor Performance in Theory and Practice was given by Messrs. S. J. Wright and E. B. Black. It dealt fully with the questions of loading the tractor, of oil dilution, and the cost of running. Mr. Wright said that: "Practically all modern tractors undergo standard tests, either in America or in this country, and their test performances are known. In particular, these tests determine the maximum draw-bar horse power that the tractor is capable of exerting in each gear over the full length of a test track." With this information it should be possible to load the tractor fully, but Mr. Wright is of the opinion that the majority of tractors in use in this country are worked below their rated loads. The question of crank-case oil dilution is intimately connected with that of tractor loading. In Mr. Wright's own words: "Because tractor drivers do not ordinarily change their oil more frequently than every 40 hours or so; and because modern-research indicates that, quite apart from dilution, engine wear is accelerated by low engine temperatures, it follows that cold running is a potential source of much unnecessary expense to tractor users. Now what is the bearing of all this on the question of loading the tractor fully in

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practice? Well, first of all, it is obvious that under-loading means, in general, a lower engine temperature; and, when the tendency already is to run engines too cold, this is an immediate cause of heavy dilution and high wear. Again, the adjustment of carburettors and vaporizers cannot be varied from one minute to another. Naturally enough they are normally set to give a mixture suitable for full load work—otherwise the tractor would not produce its full power when called upon to do so—and if they are used for light work, and particularly for intermittent work, conditions will, once more favour heavy dilution. We have heard of some very striking instances of this; a tractor of well-known make required practically a new engine after only twelve months' service—simply because its owner was so proud of it and careful not to overload it, that it was underloaded all the time; another tractor employed on a golf course, where there was naturally little heavy work to do, required expert attention three or four times every year; the owner of another odd-job tractor had his oil tested after what he regarded as a normal-period running, and found a dilution of 69 per cent.—appreciably more diluent than oil in the sump!"

"The moral is: load your tractors as fully as possible, and if light work involving much starting and stopping must be done, run on petrol and not on paraffin."

The consequence is that Mr. Wright and his colleague come to the conclusion that: "An average tractor working 800-1,000 hours per annum, costs about £150 a year to run. We estimate that, taking the average case as we have seen it in the field, about one-third of this could be saved; directly by full loading and indirectly by avoiding depreciation. There are something like 40,000 tractor users in the country and they are probably wasting £2 million a year between them."

Six papers were read on Cultivation. Their titles were: Row-crop Cultivations of Sugar-Beet, Tractor Cultivation of Potatoes with Row-crop Attachment, Row-crop Equipment, the Scientific Basis of the Art of Cultivation, Some Modern Cultivation Problems, and A Farmer's Views on Cultivation Experiments. It is not easy to summarize these papers, but they gave rise to very considerable discussion, and on the morning of Wednesday the criticism of the scientific papers, by Mr. Arthur Amos, was received with some acclamation. Perhaps a significant quotation is the introduction to Mr.

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Culpin's paper. It runs: "A survey of aims and methods of cultivations in Britain makes it readily apparent that, speaking generally, mechanization has, so far, produced little fundamental change in traditional objects and methods. In the main, the cultivations on modern, mechanized farms are carried out by tractors hauling strong multi-furrow tractor ploughs, tractor cultivators, harrows, and rolls, and doing almost exactly the same cultivations as were done in a more leisurely way a few years ago by teams of horses."

Farmers rely upon experience and judgment to determine the work that should be done in any season in preparation for a particular crop. New inventions and the use of mechanical power for cultivations suggest that, in the future, traditional methods may be the subject of a revolution, but extreme caution appears to be necessary because scientists have not yet come to definite conclusions.

As Mr. Culpin says: "Bearing in mind, then, the new possibilities in cultivation opened up by mechanical power, it is necessary to ask what soil conditions are required by various crops growing on the various soil types. The answer can only be given by finding out how each cultivation affects the soil and thereby the growth of crops. Examples of the specific questions thus raised are: What effects are produced by a deep-working implement like the Fowler "Gyrotiller"? What kind of seedbed does winter wheat require? What is the effect of rolling winter wheat in spring?"

"This paper attempts to deal with such questions as these, but I must warn you at the beginning that there are no definite answers to any of them." This last sentence is the conclusion that was come to by everybody who took part in this discussion, paper-readers and farmers as well. It is useful here to state the substance of the criticisms made by Mr. Amos with regard to the existing methods of scientific investigation. It is contained in the conclusion to his paper, as follows:

"It will be apparent that at the bottom of all my criticisms is a definite conviction that modern statistical experimentation is too rigid to be of service in studying cultivation. Once upon a time the statistician was a humble servant who did what he was told. He was used, for example, by Professor T. B. Wood, to check and criticize a large mass of loosely designed experiments in stock feeding and crop manuring—and very useful he was too. But to-day the statistician is allowed to

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dominate all agricultural experimentation autocratically, and no one dares to carry out an experiment on anything agricultural without first bowing to his rule. The result, so far as cultivation problems are concerned, is that the essential features are swamped by a mass of mathematics. If cultivation is a science, it is the only one in which the mathematician is allowed to control research, and the only one in which progress is negligible. If, on the other hand, as I believe myself, cultivation is still an art, then mathematics have nothing to do with it."

"Let me finish on a constructive note. I suggest that we should concentrate at present on purely qualitative research. Let us, for instance, follow the sort of line so ably developed by Rogers and others at East Malling. They contrive to put glass windows in the soil so that they can study by eye the actual growth of plant roots. If the same sort of thing were done in connexion with some of Mr. Culpin's work, it might be possible to observe exactly how the roots react to different textural conditions; in particular it might be possible to observe how roots negotiate, or fail to negotiate, hollows deliberately produced in the seed-bed. We could then find out what effect to look for, and decide which out of the many complications are relevant, and later we might put our conclusions to the direct test of quantitative experiment."

Maintenance of Fertility. The discussion of this subject was opened by Mr. D. Skilbeck, and no more precise conclusions emerged from the discussion of this subject than from that on Cultivations. An interesting paper was presented on behalf of Sir Albert Howard, who was unable to attend owing to illness. It dealt with what is known as the Indore Process of using waste products of agriculture for fertilizers. Since this has been widely discussed and details will be found in the publications referred to by Sir Albert, it will be sufficient to give the references here. Details of the Indore Process will be found in the following publications: *The Waste Products of Agriculture*, Oxford University Press, 1931; *The Manufacture of Humus by the Indore Method*, Royal Society of Arts, John Street Adelphi, W.C.2, 1935. In the course of this discussion Dr. E. M. Crowther presented a concise account of the existing position of fertilizer science in relation to humus. Mr. W. D. Hollis gave an interesting outline of the practical methods he had adopted to maintain

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soil fertility on farms in various parts of the country. Mr. D. R. Bomford added a contribution in which he cast some doubt upon the necessity for the use of animal manures. He said there was no precise knowledge extant on this subject and that he considered dungism to be in the nature of a religion. He thought that ideas about the maintenance of fertility were matters of opinion rather than matters of fact.

Grass Drying. The part of the Conference that undoubtedly excited the most interest was that devoted to grass drying, in the course of which the following papers were read: A Year's Progress in Grass Drying, Mr. E. J. Roberts; Practical Experiences with Grass Drying Equipment—(a) Grass Drying on a Mixed Farm with a Ransome Drier, Mr. J. E. Chambers, (b) Grass Drying with a Curtis-Hatherop Drier, Mr. A. G. Bazley, (c) Notes on Grass Drying on a Dairy Farm (I.C.I. Drier), Col. R. Vaughan-Williams; The Production of Dried Grass and its Cost: Some Preliminary Observations, Mr. R. N. Dixey and Mr. R. P. Askew; Some Speculations on the Future of Grass Drying, Professor J. A. S. Watson.

The first paper by Mr. E. J. Roberts covered every aspect of the subject because he had spent part of the year in visiting all the places where grass drying was in progress, he has seen the makers of plant, and had many discussions with interested persons. The primary matter is, of course, the production of grass for drying, and Mr. Roberts states that: "The consensus of opinion amongst producers, so far, is that there is no need to "punish" a field by subjecting it to frequent cutting for more than one season. It is considered that better all-round results will be obtained by alternating this with grazing and haying. Some producers consider that it is unnecessary even to reserve a particular field for grass-drying for one year, and that it is better to graze for a portion of the season. There is a firm minority, however, that holds that, if possible, the same fields should be reserved for the production of dried grass, because there is less danger of including such impurities as dead grass, soil from uneven ground, etc., in the product." With regard to the requirements of a good drier he states that: "A good grass drier should evaporate water efficiently without causing deterioration in the quality of the product; furthermore, this should

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be done at such a rate as to give a reasonable output, having regard to the requirements of the farm." It is, perhaps, best to state his conclusions, as follows:—

" 1. The artificial drying of grass made rapid progress in Britain in 1936, there being nearly 50 centres in operation at the end of the season. The tendency is strongly in favour of small units, while abroad large units are employed.

" 2. In the production of young, leafy herbage, differences of opinion exist as to the relative advantages of reserving fields for one or more seasons for continuous cutting and of having a rotation of cutting, grazing and haying.

" 3. The moisture content of the fresh grass has an important bearing on costs of drying, and on the throughput.

" 4. Much of the grass dried in 1936 had reached a stage of growth too advanced for the production of the best quality of dried grass. Ensilage and haymaking should be resorted to in order to prevent this.

" 5. Costs of production are higher than was anticipated, but where the product has been sold, prices have been obtained that are higher than was expected initially."

Actual producers next gave their experiences of the costs of production and the use of the product. The paper by Messrs. Dixey and Askew on costs of production during 1936, is the most informative on this subject and it seems to indicate that dried grass can be produced for between £5 10s. and £6 10s. a ton. The value of the product on the farm can be roughly assessed from these figures, but, as the writers say, " Speaking more generally, the figures which we have been considering are, perhaps, rather higher than some of us had hoped to find, and to that extent they are disappointing. But it must be remembered that grass-drying is still in its early stages, and experience has to be paid for. Any new process must go through a pioneering stage which is bound to be relatively costly. Farmers who have incurred high costs appear to be sufficiently optimistic to hope that they will be able to reduce their costs in future." . . . " When we speak of reducing the costs in future, we do not mean that startling reductions are promised for this year or next. It is not yet that grass drying will take its place as a normal activity of ordinary farming, and it may be that the pioneers will have to continue earning our gratitude for some little time to come."

Professor Scott Watson summed up the position in a

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masterly manner, and his final words on the subject were : " Taking the outlook as a whole, there is reason for moderate optimism about the future of grass drying. A total cost of the order of £6 per ton, as given in the paper by Dixey and Askew, is not to be regarded as depressing. A fair sample of the material, allowing nothing for its peculiar virtues, is worth this sum. Most of the plants costed have been in the semi-experimental stage. There is need for economies at every stage of production. But it is not unreasonable to hope that sufficient improvement will be achieved to put the process on a sound financial basis."

Combine Harvesters. The combine harvester is now becoming almost a commonplace in British farming, although it was first introduced only 8 years ago. Mr. Hosier, whose name is well known to all farmers, has only recently become converted, and he read the introductory paper: " My First Year with Combine Harvesters." This was followed by, " A Review of Combine Harvesting in 1936 " by Mr. J. E. Newman. It is interesting to learn that Mr. Hosier was instrumental in getting crops for the first combine harvester to work in, and that still earlier he had tried to persuade another farmer to introduce one. Since he is so well known for his own innovations it is amusing to learn that he was dubious about the practical use of the combine harvester in this country. His experiences last season have, however, entirely converted him. Mr. Newman's review was as comprehensive as most of his papers are.

CONTROL OF POULTRY DISEASES

THE following memorandum describing the action of the Ministry under the Diseases of Animals Act, 1935, was issued on December 9, 1936:—

1. The purpose of this memorandum is to provide an outline of the course of action which the Minister of Agriculture and Fisheries, after consultation with the Department of Agriculture for Scotland and the Poultry Advisory Committee, has decided to pursue in the exercise of the powers conferred upon him by the Diseases of Animals Act, 1935, for the control of contagious diseases of poultry in Great Britain.

2. In determining the nature of the action to be taken it is necessary to take into consideration the practical effect on the industry of compulsory measures by way of notification entailing veterinary examination and consequential restrictions on the movement of birds from infected premises and areas.

In view of the prevalence among poultry stocks of certain diseases such as fowl pox, bacillary white diarrhoea, fowl typhoid, tuberculosis, and of coccidiosis and the other parasitic infestations, and also to a less extent of fowl cholera and contagious bronchitis (laryngo-tracheitis), any attempt at compulsory measures of the kind above referred to would unduly interfere with the normal business of poultry keepers. It is not, therefore, proposed to make such diseases compulsorily notifiable, and the Ministry is informed that the industry does not desire such action. Moreover, the high administrative costs involved would be out of proportion to the advantage to be gained. Nor is such action considered necessary to secure the control of the diseases mentioned in view of the voluntary methods now available to poultry owners which are happily becoming more generally recognized and practised. These diseases will consequently be dealt with as at present by the issue of Advisory Leaflets; and through the work of existing educational institutions, supplemented where necessary by inquiries and advice by the Veterinary Inspectors of the Ministry. The notes on some of the existing poultry diseases contained in paragraphs 3 to 5 of this memorandum may be helpful. Fowl pest, which does not at present exist in this country, is, however, in a different category. The action to be taken in the event of its introduction is described in paragraph 6.

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3. **Fowl Pox, Fowl Typhoid, Bacillary White Diarrhoea.**

As a result of research carried out in recent years at the Ministry's Laboratory at Weybridge and elsewhere, considerable progress has been made in the methods of eliminating certain of the most prevalent of the contagious diseases of poultry, and adequate measures for the control of these diseases are available to poultry owners. For example, vaccines are available for fowl pox and fowl typhoid and a reliable blood test has been established for fowl typhoid and for bacillary white diarrhoea. The present facilities at the Ministry's Veterinary Laboratory, New Haw, Weybridge, Surrey, will be continued. At that institution post-mortem examinations, blood tests for the diagnosis of fowl typhoid and for the detection of adult "carriers" of bacillary white diarrhoea, and other bacteriological work on poultry are carried out at reasonable charges, and vaccines are obtainable for use against fowl pox and fowl typhoid. It is open to poultry keepers whose birds are dying, or who have other evidence of disease in their flocks, to avail themselves of these facilities or of those provided by other laboratories.

Representations have been made from certain quarters urging that fowl typhoid should be made compulsorily notifiable, but this disease does not lend itself readily to legislative action. The symptoms of fowl typhoid are not diagnostic and it would be difficult to enforce notification. It is most frequently met with on insanitary farms and is not likely to gain a hold on premises where hygienic conditions are reasonably satisfactory. It is of interest that it has not been found possible to induce this disease experimentally at the Ministry's Laboratory. Further, the availability of the blood test for diagnosis and of the vaccine already referred to places the control of the disease and protection against it very largely in the hands of individual poultry owners. There is no indication, from the present evidence, that fowl typhoid is increasing.

Avian Tuberculosis. Measures of control are also available for this disease, including the use of the tuberculin test for diagnosis.

4. **Fowl Cholera.** Any cases of fowl cholera in England and Wales which come to the knowledge of the Ministry are notified to the Veterinary Investigation Officers of the respective provincial centres who advise the owner as to the

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best methods to pursue to limit his losses and prevent the spread of infection. This procedure will be continued. In the event of any outbreak of this disease in Scotland being brought to the notice of the Ministry, arrangements will be made for inquiries to be made and advice given by one of its Veterinary Inspectors.

The mild form usually found in this country does not lend itself to complete eradication. The control of the importation of poultry imposed by the Order No. 2 described in paragraph 6 below will minimize the risk of introducing a virulent form of this disease into Great Britain from abroad.

5. Contagious Bronchitis (Laryngo-tracheitis). The Ministry has recently considered the question of dealing by administrative Order requiring notification, etc., with contagious bronchitis of poultry (infectious laryngo-tracheitis). A number of independent and widely scattered outbreaks of this disease have been discovered in England since the beginning of 1935. How or when the disease was introduced has not been established, but it would seem that it has been present unrecognized for several years. In no instance has it been possible to show any relation with a previous outbreak. Mortality varies considerably in individual cases, but on the whole, is not high. Control of the disease is rendered more difficult by the fact that recovered birds act as carriers. At present it is impossible to distinguish in the initial stages between the two types of the disease, one of a virulent character with comparatively heavy mortality and the other a mild form with a low death rate. Further research work is needed on this disease. In view of the character of the disease and the circumstances in which it can be spread, the adoption of a slaughter policy in the case of this disease is not likely to result in its eradication. Further, such measures would in any case involve stringent restrictions, including closure for at least 28 days, of all premises where the poultry stocks were traced as having been exposed to infection by contact either at markets or otherwise with diseased poultry, a course of action which it is understood is not favoured by poultry owners. Even this measure would not disclose the existence of "carrier" birds which may be the cause of an outbreak at a very much later date. In other countries where the disease is prevalent no effective official action is considered possible, and owners are left to take

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voluntary steps to minimise their losses. Where cases of the disease are brought to the notice of the Ministry in this country, it is proposed to follow the same procedure as that described in paragraph 4 relating to Fowl Cholera. The Ministry's Advisory Leaflet No. 250 gives the owner advice as to the steps which should be taken, and this Leaflet will be widely distributed.

Legislative Action—New Orders.

6. Having regard to the conditions under which the poultry industry is carried on at the present time in Great Britain, legislative action is directed to three main purposes, namely:—

(i) Provision for dealing with the serious exotic diseases which if allowed to spread might have disastrous consequences to the industry. The only diseases at present coming within this category are those included in the term fowl pest (which includes fowl plague and Newcastle disease). The mortality in affected flocks sometimes reaches 100 per cent. but the disease does not exist at present in Great Britain. The disease is being made compulsorily notifiable by the *Fowl Pest Order of 1936* described below.

(ii) The control of the importation of live poultry, and of eggs intended for hatching, to prevent the introduction of fowl pest and also of contagious bronchitis (laryngo-tracheitis) and the virulent forms of fowl cholera. An Order with this object in view has been made entitled the *Poultry and Hatching Eggs (Importation) Order of 1936*, described in detail below. In framing this Order the opportunity has been taken of including in the prescribed veterinary certificate to accompany imported poultry and hatching eggs provisions to ensure their freedom from the more commonly existing diseases as well as from fowl pest. As fowl pest does not exist in Ireland, the Channel Islands or the Isle of Man, the provisions of the Order do not apply to poultry or hatching eggs brought from those countries.

(iii) The prevention, so far as may be practicable without unduly interfering with the poultry trade, of the spread of infection at markets and through the agency of poultry receptacles. It is not considered a practicable proposition effectively to prohibit the exposure of diseased poultry at markets partly on account of the administrative difficulties involved and partly because of the objection of the poultry industry as a whole to official interference in the case of the commonly existing poultry diseases. Action is therefore being limited to the compulsory cleansing and disinfection after each occasion of use of market pens and receptacles used for poultry. These requirements are imposed by the *Poultry Markets and Receptacles (Disinfection) Order of 1936*.

The three Orders mentioned, the provisions of which are summarized below, are the first statutory regulations to be imposed in Great Britain dealing with poultry diseases, and they are, of course, subject to alteration or addition as experience may prove desirable. It is hoped that all connected with the poultry industry and concerned in its welfare will

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co-operate actively with the Ministry and with Local Authorities in the observance of these regulations, which are made solely for the protection of poultry keepers and with the full concurrence of representatives of the industry.

(I) THE FOWL PEST ORDER OF 1936.

This Order came into operation on January 11, 1937, and applies to any form of fowl pest (including fowl plague and Newcastle disease).

(a) *Compulsory Notification (Article 1).*—The Order requires every person having in his possession or under his charge any poultry or the carcass of any poultry affected with or suspected of fowl pest to send a written notification immediately to the Director, Laboratory of the Ministry of Agriculture, New Haw, Weybridge, Surrey, giving the address of the premises where the poultry or carcass is, the name of the owner or person in charge, the approximate number of live poultry on the premises, and the approximate number of deaths (if any) during the preceding 28 days. *The owner is also required by the Order to despatch to the above-named Laboratory for examination the carcass of a diseased or suspected bird, securely packed in a box with sufficient absorbent material to prevent leakage and labelled with the name and address of the sender and with the words "Suspected Fowl Pest."* The box should not be sent by post, and if sent by rail must go by passenger train. No fee will be charged for the examination.

Veterinary Surgeons observing any suspected case must also notify the Director of the Laboratory in writing and call the owner's attention to his obligation to forward the carcass to the Laboratory. Any Veterinary Inspector who observes a suspected case is required to notify the Laboratory and also to forward the carcass to the Laboratory.

The diagnosis may occupy from 5 to 10 days.

(b) *Precautionary Restrictions pending Diagnosis (Article 2).*—The owner will be notified as soon as possible by the Ministry as to whether or not the diagnosis confirms the presence of fowl pest. Meantime, the owner is required by the Order :—

(i) to prevent the access of other poultry, or of any person except the attendant, to that part of the premises where any suspected bird or carcass is or was kept ; and

(ii) to detain all other poultry on the premises except the dressed carcasses of healthy birds.

The attention of the owner will be called to this provision in a letter from the Ministry's Laboratory acknowledging the receipt of the notification of disease.

(c) *Diagnosis at Ministry's Laboratory (Article 3).*—The diagnosis will be determined at the Ministry's Veterinary Laboratory in all cases.

(d) *Declaration of Infected Place (Form A) and Application of Rules (Article 4).*—On confirmation of disease the Ministry will notify the Local Authority who are required to cause a Notice (Form A) as specified in the Schedule to the Order forthwith to be served on the occupier of the premises declaring an Infected Place and applying thereto certain Rules for the prevention of the spread of infection. Form A can only be withdrawn by the Ministry.

(e) *Compulsory Slaughter (Articles 5 and 6).*—Provision is made for the compulsory slaughter by and at the discretion of the Ministry of all

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affected stocks and of any stocks directly exposed to infection, with compensation for stock other than diseased stock so slaughtered to the extent of their value immediately before slaughter.

(f) *Cleansing and Disinfection (Article 7).*—Provision is made for such cleansing and disinfection of premises on which disease exists or is suspected as the Ministry's Inspector considers necessary.

(g) *Restrictions on Poultry exposed to Infection (Article 8).*—This Article requires an Inspector to serve a Notice of Detention (Form B) in respect of any other poultry stocks on premises which appear to have been exposed to infection. These Notices prohibit the movement of poultry into or out of the premises except by licence, and should remain in operation for a period of 14 days' duration from the last known date of possible contact with infection.

Symptoms of Fowl Pest.

The term "fowl pest" includes the diseases known as fowl plague and Newcastle disease. These are highly dangerous virus diseases which may cause heavy and rapid mortality.

Fowl Plague may affect domestic fowls, turkeys, geese, ducks and guinea fowls. The period of incubation varies from two to seven days and birds affected with the acute form are frequently found dead without exhibiting previous symptoms. The affected birds refuse food, are generally dejected, listless, feathers are ruffled and in some cases there is a discharge from the eyes and nostrils.

Newcastle Disease naturally affects the common fowl and may be transmitted to pigeons, ducks and geese. The period of incubation is from five to seven days. Affected birds refuse food but drink frequently, and stand in a crouching position. They assume a sleepy appearance with eyes half or fully closed, and wings and legs often become paralysed. The most characteristic symptom is seen in the respiratory system. There is a long gasping inhalation through the half open mouth accompanied by gurgling and a frothy exudate from the point of the beak.

(2) POULTRY AND HATCHING EGGS (IMPORTATION) ORDER OF 1936.

This Order, which will come into operation on February 15, 1937, controls the importation of (i) domestic fowls, turkeys, geese and ducks; (ii) day-old chicks of domestic fowls, and (iii) the eggs of domestic fowls intended for hatching. The Order—

(a) Prohibits the landing in Great Britain of *live poultry of the above species (other than day-old chicks)* from any other country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man, with the proviso that :—

(i) Consignments may be landed with a licence previously obtained from the Ministry and subject to such conditions as may be prescribed.

(ii) Small consignments of poultry, other than geese, not exceeding 21 birds (estimated to include about three breeding pens) may be landed if accompanied by a certificate signed by a Veterinary Officer of the Government of the country of origin to the effect that there has been no outbreak of fowl pest within a radius of 15 miles of any premises on which the poultry have been kept during the previous six months ; that, in the case of domestic fowls and turkeys, they were tested for bacillary white diarrhoea, fowl typhoid and tuberculosis within the

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preceding month and found to be free from those diseases ; and that the poultry to be imported, and the flocks from which they were brought, were also free from fowl cholera, contagious bronchitis, fowl pox and fowl paralysis.

(b) Prohibits the landing in Great Britain from any other country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man of *day-old chicks of domestic fowls, or the eggs of domestic fowls declared on the Customs entry to be intended for hatching*, or the use of such eggs for hatching, unless the chicks or eggs are accompanied by a certificate signed by a Veterinary Officer of the Government of the country of origin to the effect that during the period of six months preceding the proposed date of shipment (a) the fowls from which the eggs were produced and (b) the poultry on the premises on which the chicks were hatched, have been free from fowl pest and have not been kept on, nor within 15 miles from, any premises where fowl pest then existed or had previously existed within the said period of six months ; that the fowls from which the chicks and/or eggs were produced had, within the preceding six months, been tested and founded free from bacillary white diarrhoea, and fowl typhoid, and had not subsequently been in contact with untested birds or with reactors ; and that the flocks from which the chicks and/or eggs were produced were also free from fowl cholera, contagious bronchitis, tuberculosis, fowl pox or fowl paralysis.

(c) Prohibits the transshipment at a port in Great Britain of poultry brought from any country except Northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man.

Special provision is made for dealing with poultry landed in contravention of the above regulations.

(3) POULTRY MARKETS AND RECEPTACLES (DISINFECTIION) ORDER OF 1936.

This Order came into operation on January 11, 1937, and will require the cleansing and disinfection in the prescribed manner of:—

(a) Every pen or other enclosure and every bench, stand or other fitting used for poultry in any market, fairground, saleyard, highway or other premises where live poultry are habitually exposed for sale as soon as practicable after being used for that purpose and before being again so used ; and

(b) Every receptacle used for the conveyance of poultry to any place in Great Britain or for the exposure for sale of poultry, as soon as practicable after each load of poultry has been removed, and before being again used for poultry. Similar cleansing and disinfection is required of receptacles (after the poultry have been discharged) which are to be returned empty or sent by railway, hired road vehicle, vessel or aircraft, before they are so despatched.

The prescribed process consists of a thorough and effectual cleansing followed by a thorough washing or spraying with a 4 per cent. solution of washing soda, this being free from the risk of tainting. The sweepings of the pen, droppings, litter, etc., are required to be effectually removed from contact with poultry.

THE CHOCOLATE SPOT DISEASE OF BROAD AND FIELD BEANS*

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CHOCOLATE SPOT disease is widespread in England and Wales, and affects both broad and field beans. Symptoms range from a well-defined chocolate-coloured spotting of the foliage and streaking of the stems, to a "blight" in which the lesions coalesce, causing partial defoliation, blackening and death of the plants. The former, or "non-aggressive" type of infection, may appear from December onwards, but unless very severe it does little damage, and the foliage produced subsequent to the attack is often free from spots. The latter, or "aggressive" type of infection, usually develops only in the four months April to July, and four or five years often elapse between serious epidemics. When epidemic "aggressive" infection does occur, it is capable of destroying a bean crop very quickly.

Chocolate Spot also affects sainfoin and vetches and the damage done may occasionally be serious. The symptoms of infection are similar to those seen on beans.

Mention may be made of certain agents causing symptoms resembling those of Chocolate Spot and frequently confused with that disease. The exudate (honeydew) of the black bean aphid causes chocolate-coloured spotting that should be termed Aphid Injury; it is in no way related to true Chocolate Spot. Chocolate-coloured discoloration caused by frost is fairly common in the early part of the year, but is usually diffuse, the foliage presenting a "scorched" appearance, frequently accompanied by distortion of the shoots. Mechanical injury, such as friction against the ground, may also produce diffuse chocolate discoloration of bean shoots. Two leaf

* For a detailed account of the investigation, see WILSON, A. R.: The Chocolate Spot Disease of Beans (*Vicia Faba* L.) caused by *Botrytis cinerea* Pers., *Ann. Appl. Biol.*, XXIV, 1937 (in the press). Dr. Wilson held one of the Ministry's Agricultural Research Scholarships from 1931 to 1934, during which period he carried out a considerable amount of work on Chocolate Spot Disease. From October, 1934 to October, 1936, he continued his investigations on this problem with the aid of a Carnegie Scholarship and a research grant from the Agricultural Research Council.

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spot fungi, *Ascochyta Fabae* Speg. and *Cercospora Fabae* Fautr., produce on bean leaves lesions that, in their initial stages, resemble those of true Chocolate Spot.* The diseases caused by these fungi are of little economic importance in Britain.

The Cause of the Disease. The cause of Chocolate Spot has been the subject of considerable controversy during the past fourteen years. For many years the causal agent of the disease in Britain was considered to be *Bacillus Lathyri* Manns and Taubenh.,† a bacterium which, in the light of recent research, is now considered to live only on dead material and not to cause any specific disease. The present investigation, begun in Cambridge in 1931, has shown beyond any doubt that the common grey mould fungus, *Botrytis cinerea* Pers., is the cause of Chocolate Spot in Britain.

Infection. *Botrytis cinerea* grows on almost any kind of plant debris such as fallen leaves, etc., on which, under moist conditions, large numbers of minute greyish spores are formed. These are blown by wind or splashed by rain on to the surfaces of bean shoots and may remain dormant there for more than a month. If weather conditions are suitable, however, the spores germinate at once and the fungus penetrates the underlying tissues. The first visible sign of infection is the appearance of very small black spots on the leaves and streaks on the stems. These lesions enlarge and turn brown within five days. Healthy bean plants tend to resist the spread of the fungus in their tissues, and, therefore, the infection may be localized; in this case the symptoms are those of "non-aggressive" infection. If, however, very large numbers of spores germinate on the shoots and penetration occurs in many places, this resistance is broken down and the fungus spreads freely in the tissues, giving rise to the symptoms of "aggressive" infection. When plants are weakened by the influence of some soil factor their resistance is lowered and they succumb to "aggressive" infection more easily than a healthy crop. Patches of stunted plants in a field are often killed by the *Botrytis* while their healthy neighbours

* WOODWARD, R. C. : *Cercospora Fabae* Fautrey on Field Beans, *Trans Brit. Mycol. Soc.*, XVII, 1932, 195.

† PAINE, S. G., and LACEY, M. S. : Chocolate Spot Disease or Streak Disease of Broad Beans, *This JOURNAL*, XXIX, 1922, 175.

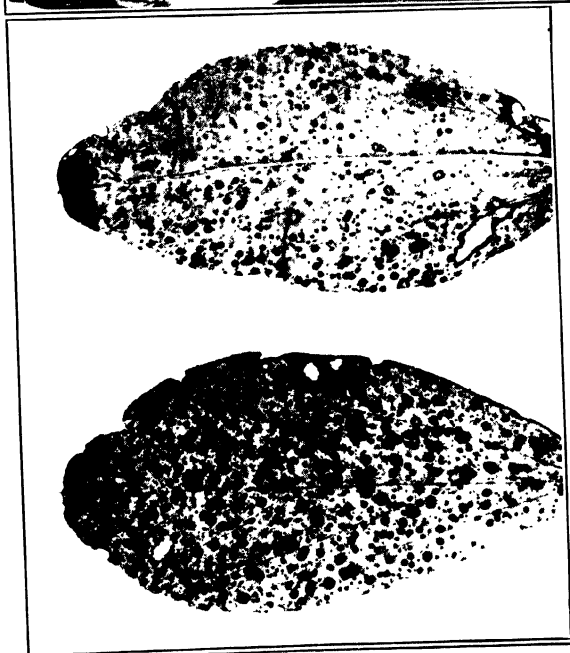


FIG. 1.—(Above) Field bean leaves showing severe natural Chocolate Spot infection of the "non-aggressive" type.

FIG. 2.—(Left) Field bean shoot killed by natural "aggressive" infection, and bearing large numbers of spores of the fungus on the surface.

FIG. 3.—(Right) Shoot of field bean, taken from a plant growing in a field plot, and showing artificially widened "non-aggressive" and slight "aggressive" Chocolate Spot infection. The foliage was sprayed, during wet weather, with a spore suspension of *Botrytis cinerea* in water.

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show only the localized lesions of "non-aggressive" infection. Under suitable conditions vast numbers of spores are formed on dead plants, and these act as centres of infection for the rest of the crop.

Conditions Favouring the Disease. Infection does not occur unless there is a film of moisture present on the plants; any factor tending to cause evaporation of such a film will, therefore, reduce the chances of attack. The conditions favouring epidemics are prolonged periods of wet weather and high humidity to ensure plentiful spore production and the establishment and maintenance of a water film on the plants, little or no wind to cause evaporation of the film, and an air temperature between 55° F. and 77° F.

Certain soil conditions have been found to favour the disease by weakening the plants. Potash and phosphate deficiency of the soil has been found by several workers to render the disease more severe. The writer has observed that potash deficiency may increase the severity of "aggressive" attack but has little influence on "non-aggressive" infection. Sour soil and waterlogging have also been observed to increase the severity of Chocolate Spot.

Control. The investigation has revealed no satisfactory method of control of the disease. The chances of the disease assuming epidemic proportions are, however, reduced if care is taken to correct potash and phosphate deficiency,* sour soil and poor drainage. Spring-sown beans have been found less subject to Chocolate Spot, but are more so to aphid infestation.

The writer wishes to record his indebtedness to Professor F. T. Brooks, of the Botany School, Cambridge, and to express his thanks to Advisory Mycologists in many parts of Britain.

* SCOTT WATSON, J. A. : Notes on Moulding, This JOURNAL, XLIII, 1936, 178.

THE COMPOSITION AND FEEDING VALUE OF HEATHER AT DIFFERENT PERIODS OF THE YEAR

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THE increasing economic importance of grass as an agricultural crop has been a striking feature of the last decade, and both chemists and botanists have rightly given time and attention to its study under every conceivable treatment and condition. The non-graminaceous plants that make such a valuable contribution to our upland grazings have been almost completely ignored. Of such plants, heather (*Calluna vulgaris*) is probably the commonest, and certainly the most useful, the gross annual value of the crop being much greater than is generally realized.

As a fodder plant, heather differs from grass in one important respect; it is an evergreen, and being fairly resistant to frost, can and does provide keep throughout the whole year. It is the staple diet of the red grouse, which eats it at all seasons and is, in winter, entirely dependent on it. On many hill farms the Blackface sheep subsists largely on heather, except during the few weeks that are spent on in-by land at lambing time.

Very little is known of the extent to which hill sheep consume the different plants—ericaceous and graminaceous—that go to make up the moorland sward. On typical "black land," which may carry 90 per cent. or more of heather, it is obvious that this plant must provide a very large proportion of the food at all times of the year. It is true that for a brief period during early spring the draw-moss or sheathing cotton-sedge may make a valuable contribution to the diet, and that other moorland plants are eaten to a limited extent during the summer and autumn. On moor that has been recently burned the role of such subsidiaries takes on an added importance. In the winter months, however, heather must be regarded as the staple food of sheep on "black land"; when there is much snow lying, it may be the only food that sheep can reach.

As a result of the work of Wilson and Leslie* much detailed and accurate information as to the diet of the grouse

* "The Grouse in Health. and in Disease" (Final Report of the Committee of Enquiry on Grouse Disease). Vol. I, 67-87.

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is available. These workers examined several hundreds of crops, obtained at different periods of the year, from 33 counties in England and Scotland, and were able to arrive at estimates of the proportions of heather and of subsidiary foods consumed during each month. It was shown that, at any time between September and May, not less than about 80 per cent. of the food eaten was heather, and that in March and April heather shoots constituted nearly 100 per cent. of the diet. During spring and early summer heather continued predominant, despite the fact that a number of subsidiary foods were then available. Only in July did consumption fall to any serious extent; during this month heather was displaced by nearly 50 per cent. of blaeberry and other subsidiaries. This state of affairs continued to some degree during August, when an abundant supply of berries is available on many moors; thereafter the birds consumed little but heather.

It appears, therefore, that, on "black land," both the hill sheep and the grouse subsist largely on heather at all times, and that during the winter months they are almost entirely dependent upon it. Despite this, the nutritive value of the crop at different seasons of the year has never been seriously studied, and no reliable information as to the quality of winter heather is available. It has been customary to assume that the crop is of highest feeding value when the new shoots appear in May, and that there is a consistent fall to a minimum in winter. Wilson and Leslie* state that "just as the first flush of early pasture is more nourishing than the later growth, the first heather shoots of spring probably contain a larger percentage of nutritive value than at any other time of the year, and it is doubtless due to this cause that grouse make such rapid progress in size and strength between the date of hatching in May, and the opening of the shooting season some 10 or 12 weeks later." Both of the assumptions contained in this paragraph are reasonable, but it may be as well to remember that they are assumptions and nothing more. With the second one, viz., that the rapid growth of young grouse is due to the superior quality of spring heather, the writer is not at present concerned, although it is possible that certain of the supplementary foods are no less important in this respect than heather. The

* *Ibid.*, Vol. I, 72,

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question of seasonal variation in the composition and feeding value of heather is one that is capable of investigation, and it was considered that the collection of some reliable data would prove of interest.

Material for the purpose of this investigation was obtained from the hill farm of Newbiggen, Blanchland, Northumberland. The heather, which is on "dry moor" at an elevation of not less than 1,100 feet, is exceptionally well managed, being burned on a regular 10-year rotation. Areas that had been burnt 3, 5, and 7 years previously were sampled on 4 occasions during the summer and autumn of 1934 (June 20, July 23, September 12, and October 12), and once during the winter of 1934-35 (January 12). Each sample was made up of a large number of random cuttings taken within a radius of 12 yards from a central marking-post. That portion of leaf and stem estimated to be of the current season's growth, and which would comprise most of the material eaten by sheep and grouse, was separated by hand picking and thereafter dried and ground. The usual analytical methods were employed in the examination of samples, but an attempt to determine the digestibility of the crude protein *in vitro* was abandoned. Artificial digestion with a hydrochloric acid solution of pepsin, a method which, when applied to pasture grass, gives coefficients comparable to those obtained *in vivo*, appears to be quite unreliable with ericaceous plants. The analytical results obtained are tabulated below.

From the above figures it appears that, in the youngest heather, crude protein is at a maximum in June. In samples taken during late summer and autumn the protein content is appreciably lower, but there is little evidence of any consistent decline with the advancing season. The January sample, in which a minimum value is reached, shows that there has been a substantial fall during the winter. In the older heather, material collected in June is not outstanding, but loss of protein is evident in October, the samples taken during this month being little better than those of January. The total range of variation shown by the 5- and 7-year heather is, however, quite small, and, in the latter, can be regarded as negligible. The ratio of true to crude protein never falls below 0.85, and considerably exceeds this figure in all samples taken later than June. It would be reasonable to anticipate that the spring growth will show a relatively higher non-protein nitrogen content, and this has been

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TABLE I.—PERCENTAGE OF DRY MATTER.

	Sampling Date	June 20	July 28	Sept. 12	Oct. 12	Jan. 12
3 years after burning	*Crude protein ..	12.93	10.16	9.55	10.12	8.74
	Ether extract ..	1.29	2.37	5.10	4.09	3.46
	Fibre	17.89	19.36	21.23	17.99	17.73
	†Ash	4.81	4.34	4.26	4.15	4.05
	N-free extractives ..	63.08	63.77	59.86	63.96	66.02
	*Including :—					
	True protein ..	12.26	9.43	8.68	9.36	8.59
	†Including :—					
	Phosphoric acid (P ₂ O ₅) ..	0.38	0.41	0.30	0.32	0.31
	Lime (CaO) ..	0.87	0.78	0.69	0.72	0.60
	True/crude protein ratio	0.96	0.93	0.91	0.92	0.98
5 years after burning	*Crude protein ..	8.59	8.75	8.47	7.86	7.65
	Ether extract ..	2.94	3.83	4.51	4.28	3.86
	Fibre	19.59	20.62	21.11	20.25	18.05
	†Ash	3.46	3.29	3.12	3.55	3.14
	N-free extractives ..	65.41	63.74	63.05	64.30	66.76
	*Including :—					
	True protein ..	7.34	8.52	8.32	7.67	7.56
	†Including :—					
	Phosphoric acid (P ₂ O ₅) ..	0.27	0.27	0.26	0.23	0.21
	Lime (CaO) ..	0.67	0.78	0.81	0.76	0.85
	True/crude protein ratio	0.85	0.98	0.98	0.98	0.99
7 years after burning	*Crude protein ..	7.46	7.52	7.43	7.22	7.10
	Ether extract ..	3.31	3.51	4.16	4.31	4.24
	Fibre	20.92	21.13	20.84	20.12	20.11
	†Ash	3.92	3.79	3.75	3.87	3.18
	N-free extractives ..	64.39	64.05	63.82	64.48	65.37
	*Including :—					
	True protein ..	6.43	7.03	7.34	7.16	6.95
	†Including :—					
	Phosphoric acid (P ₂ O ₅) ..	0.24	0.27	0.24	0.23	0.22
	Lime (CaO) ..	0.85	0.85	0.82	0.78	0.94
	True/crude protein ratio	0.86	0.93	0.99	0.99	0.98

realized in the 5- and 7-year samples. The high true-crude protein ratio in the June sample of 3-year heather is difficult to explain.

An inspection of the figures relating to fibre content discloses some interesting features. While the total range of variation is never large, the January samples of all ages actually contain less fibre than samples taken at any other

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period. At 3 and 5 years after burning a maximum is reached in September, but at 7 years, such differences as occur during summer and autumn are too small to be of significance. There is no good evidence of any inverse relationship between crude protein and fibre.

The oil or, more correctly, ether extract content of ericaceous plants is substantially larger than that of pasture grass, but its value from a nutritional standpoint is so questionable as to make the figures in Table I of minor interest. It appears, however, that seasonal variation is marked at all ages, but shows a tendency to become less in the oldest heather. Ether extract is at its lowest in June and rises consistently to a maximum in September or October. Winter heather contains rather less than is found in September and October, but in no instance is the difference considerable.

The two mineral constituents determined, viz., phosphoric acid and lime, both show appreciable seasonal variation in the youngest heather, being present in greatest amount during June and July, and falling to a minimum in winter. At 5 years after burning, phosphoric acid alone shows a similar tendency, and at 7 years there is no evidence that the percentage of either phosphoric acid or lime present is affected in the slightest degree by season.

The absence of digestibility data admittedly detracts from the usefulness of the results obtained, in that it does not allow the feeding value of the samples to be stated in the conventional way, i.e., in terms of starch and protein equivalents. The fact that there is little likelihood of such data becoming available does not make it any less necessary to interpret the results with caution; nevertheless, it should be possible to arrive at reasonable estimates of feeding value.

It may be concluded that young heather is at its best during early summer, and that thereafter its value declines to a minimum, which is probably reached in early winter. Although this decline is of significant magnitude it is less marked than might be anticipated. At 5 years or more after burning, season of the year appears to have a smaller effect on feeding value, and at 7 years, variation is very slight.

When these findings are considered in relation to the seasonal requirements of the sheep and grouse, it will be realized how well Nature has adapted the heather crop to be the mainstay of both species. Sheep will eat the youngest heather in spring and summer when its nutritive value is at

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a maximum, but during long periods of severe weather in winter nothing but upstanding heather may be available, and they must perforce fall back on older growth. As has been shown, the feeding value of this more mature heather has not depreciated to a serious extent, and being probably eaten in greater bulk it is well able to sustain life.

Adult grouse will not feed on young heather while they can find plenty of close-growing material of mature age; it is thus probable that their winter food is little inferior to that which they eat in summer and autumn. On the other hand, young grouse prefer the youngest heather, and, on well managed moors, they should have no difficulty in getting it. When it is no longer available to them, they are already adult and can subsist on the older growth. It has been stated by the workers previously referred to* that grouse need and eat five times more food per day between December and March than between October and November. While admitting that more food is required in winter to maintain the body temperature, it is contended that by far the greater part of this increased consumption can be accounted to the inferior food value of winter heather. If these views are accepted, it follows that heather must have a nutritive value which is, at a conservative estimate, two or three times greater in spring and summer than in winter. It need only be said that the results that have been discussed in this article provide no evidence that seasonal variation in nutritive value is of any such magnitude.

The writer desires to acknowledge his indebtedness to Jasper Stephenson, Esq., J.P., of Newbiggen, Blanchland, for his courtesy in providing facilities for this work.

* *Ibid.*, Vol. I, 79.

THE EFFECT OF POULTRY ON THE CHEMICAL COMPOSITION OF HERBAGE AND SOIL

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Folded Poultry and Down Herbage. The folding system as practised on the drier calcareous soils in the West Country has proved popular on account of its relative simplicity, and because of the vast improvement in the Down pastures, which are now grazed by dairy cattle. Twenty-five adult birds are put in one fold unit and moved daily so as to cover one acre of land annually. This rate of stocking is low, since 50 to 60 birds per acre can be kept on free range with other farm live stock, but, in the type of unit under discussion, the 25 adult birds seem to be overcrowded and the number might perhaps be reduced to 15 with advantage to the health of the birds. When the improvement of the land is the main object in view, the system has a three-fold advantage: (1) the land is not fouled, (2) the droppings are deposited immediately and evenly without loss of soluble constituents, and (3) the concentration of 25 birds on an area of approximately 80 sq. ft. for one day subjects the land to intense mechanical treatment. This area does not include that covered by the night roost, and the folds should be so arranged and moved that the night roosts rest over areas scratched over on the previous day.

The valuable effect of poultry on poor pastures has to be seen to be fully appreciated. Thus, a typical old Down pasture containing up to 60 per cent. of fine-leaved fescue grasses (mostly tufted or matted) was in twelve months converted into a good second-grade cow pasture, containing a useful mixture of grasses and clovers. The improvement in the chemical composition of the herbage is shown in Table I.

The spring samples were taken after poultry had been folded over the land during the winter and early spring months, while the autumn samples were collected after the land had received similar treatment during the summer months. Table I shows the effect of folded poultry on Maiden Down. The practice resulted in large increases in

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TABLE I.*—EFFECT OF FOLDED POULTRY ON THE NUTRITIVE VALUE OF DOWNLAND HERBAGE

County : Soil : Centre :	SPRING HERBAGE (early June)				AUTUMN HERBAGE (early October)			
	Wiltshire Chalk Wexcombe 1		Wiltshire Chalk Wexcombe 2		Wiltshire Chalk Wexcombe 1		Gloucester Oolite Notgrove	
	Maiden Down, No Poultry	Folded Poultry	Maiden Down, No Poultry	Folded Poultry	Maiden Down, No Poultry	Folded Poultry	Maiden Down, No Poultry	Folded Poultry
†Crude Protein ..	11.2	15.3	11.7	15.8	12.8	17.7	10.8	22.1
Silica-free Ash ..	5.9	7.8	5.6	9.3	3.3	5.1	5.2	9.3
Lime (CaO) ..	1.75	2.12	1.45	2.11	0.82	0.80	1.24	1.66
Phosphoric Acid (P ₂ O ₅)	0.52	0.84	0.65	0.81	0.61	0.86	0.60	0.98

* All samples of herbage and soil in this investigation were taken in duplicate, but only mean results are reported.

† As percentage of the dry matter.

the crude protein, silica-free ash and phosphoric acid contents of both spring and autumn herbage, and indicates the value of poultry as a means of improving Downland pastures for cattle and sheep. Even for poultry (subsequently folded over the same land), the improved quality of the herbage may not be without significance, since Prentice and Co-workers¹* in Northern Ireland, and Price and Burdett² in Wiltshire, have shown that egg production and the health of laying birds may be satisfactorily maintained on a ration of cereals, supplemented only by limestone and salt, provided that the birds are running out on good pasture. On such low protein rations the birds consume pasture herbage to a far greater extent than normally, and this suggests that the protein requirements of laying birds can, in part at least, be supplied by young and leafy herbage.

Poultry in Pens. Samples of spring herbage from a large number of poultry pens in the West of England were examined. Most of the samples were taken from the pens at County Egg Laying Trials by courtesy of the County Agricultural Organizers and Poultry Instructors, who also kindly supplied information concerning the treatment of the pens. This information may be summarized as follows:—

At Laying Trial Centres the pens are usually 10 yards × 12 yards and provide an area of 20 square yards per bird.

* References are given on p. 1067.

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At some centres duplicate pens are available, making it possible to rest one of the pens for a period that varies from one month to one year. At all centres, lime at the rate of approximately 1 ton per acre is applied to the grass in the autumn. At all but one of these centres surplus grass in the pens is cut over two or three times a year. At the one exception, the pens are grazed by sheep, and, in spite of a certain amount of damage done to posts and wire netting by the sheep, it is claimed that this is more than compensated for

TABLE II.—EFFECT OF PENNED POULTRY ON THE CHEMICAL COMPOSITION OF THE DRY MATTER OF SPRING HERBAGE

Centre	Subsoil	Grazing of Poultry Pens	Untreated No Poultry or Grazing				Poultry Pens			
			Crude Protein	Silica-free Ash	Lime (CaO)	Phosphoric Acid (P ₂ O ₅)	Crude Protein	Silica-free Ash	Lime (CaO)	Phosphoric Acid (P ₂ O ₅)
Berks (E) ..	Gravel ..	Cow	13.1	5.1	0.95	0.56	16.0	5.9	0.78	0.83
Bristol (F 1)	Keuper Marl	Nil	12.1	4.9	0.84	0.50	13.1	6.1	1.12	0.81
Cornwall (E) ..	Clay Slate ..	Nil	13.0	5.8	0.93	0.46	16.2	6.9	0.94	0.78
Devon (E) ..	" Sand " ..	Nil	12.8	6.1	1.12	0.77	16.4	7.8	1.39	0.93
Dorset (E) ..	Chalk ..	Nil	13.6	5.0	0.98	0.41	17.8	6.9	1.03	0.75
" (F 1)	" ..	Cow	15.4	6.1	1.67	1.03	17.2	7.7	1.23	1.25
" (F 2)	" ..	Cow	13.1	6.4	1.54	0.91	18.1	8.3	1.44	1.13
Hants (E) ..	" ..	Nil	11.9	5.9	1.48	0.40	12.9	6.6	1.51	0.63
Middlesex (E) ..	Gravel ..	Mixed	10.9	6.5	1.08	0.77	19.9	6.5	1.06	0.89
Wilts (F 1)	Chalk ..	Nil	11.2	5.9	1.75	0.52	15.8	7.3	2.00	0.81
" (F 2)	" ..	Mixed	9.3	7.1	2.32	0.82	15.7	8.6	2.22	1.13
MEANS ..			12.4	5.9	1.33	0.66	16.3	7.1	1.34	0.90

E = County Egg-laying Trials.
F = Poultry Farmer.

by the saving of labour and time that would otherwise be necessary to keep the grass in order by hand. On certain farms, Dexter and Jersey cattle have been employed with considerable success to keep the grass in check.

The results obtained from the chemical analysis of spring herbage from the pens and from untreated areas near to the pens are given in Table II.

The results given in Table II are similar to those in Table I; that is, there is a general improvement in the protein and phosphoric acid status of the herbage of all pens. The improvement is usually greatest where the pens are subjected

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to grazing by sheep and/or cows. The grazing animals prevent the development of fibrous tufts and help to maintain a more uniform sward.

Samples of autumn herbage were collected from poultry pens at six centres only, but Table III again suggests that

TABLE III.—CHEMICAL COMPOSITION OF AUTUMN HERBAGE OF POULTRY RUNS AND PENS

Centre	Subsoil	No Poultry				Poultry Pens			
		Crude Protein	Silica-free Ash	Lime (CaO)	Phosphoric Acid (P_2O_5)	Crude Protein	Silica-free Ash	Lime (CaO)	Phosphoric Acid (P_2O_5)
*Bristol ..	Keuper Marl..	11.3	5.3	0.66	0.93	18.5	6.8	0.60	1.10
Dorset 1 ..	Chalk.. ..	14.5	6.8	1.63	1.00	18.0	7.1	1.19	1.20
" 2 ..	"	11.2	4.9	1.30	0.68	17.4	7.0	1.24	1.03
Wilts 1 ..	"	13.0	6.4	1.89	0.78	15.7	7.8	1.18	0.83
" 2 ..	"	11.7	5.6	1.45	0.65	15.3	6.8	1.12	0.84
Worcs ..	Keuper Sand-stone	13.2	5.1	1.01	0.70	22.0	7.6	0.87	0.89
MEANS ..	.. ..	12.5	5.7	1.32	0.79	17.8	7.2	1.03	0.98

* The soil at this centre was very acid, and an application of lime at the rate of 2 tons per acre increased the lime content of the herbage by 70 per cent.

poultry can exert a marked influence upon the composition of autumn herbage.

It is the custom to select dry light land for poultry, and for economic reasons poor grass land is commonly chosen. The data illustrate the relatively low value of the original

TABLE IV.—SEASONAL VARIATION IN CHEMICAL COMPOSITION OF SECOND GRADE NATURAL PASTURES IN THE WEST OF ENGLAND
(as percentage of dry matter)

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Crude Protein ..	14	15	16	19	19	13	16	16	15	16	15	16
Lime (CaO) ..	0.9	1.1	1.0	1.0	1.1	1.2	1.3	1.3	1.1	1.2	1.2	0.9
Phosphoric Acid (P_2O_5) ..	0.7	0.7	0.6	0.7	0.9	0.6	0.8	0.7	0.7	0.8	0.6	0.7

herbage of the poultry runs at the centres investigated. The crude protein content of this herbage is lower than that of herbage of second grade natural pastures at any month of the year, as will be seen from a comparison of Tables II and III with Table IV.

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The spring herbage of the poultry pens and runs is definitely superior in nutritive value to the original herbage, but even this improved spring herbage only approximates in composition to the herbage of second grade pastures. The autumn herbage, however, has a relatively higher nutritive value and surpasses the autumn herbage of natural pastures in its content of crude protein and phosphoric acid.

TABLE V.—CENTRE—DORSET F. 1

Composition of Dry Matter Per cent.	Spring Herbage			Autumn Herbage		
	Land not Stocked with Poultry	Pens Treatment during Winter		Land not Stocked with Poultry	Pens Treatment during Summer	
		A. Rested	B. Stocked		A. Rested	B. Stocked
Crude Protein ..	15.4	15.6	17.2	14.5	14.3	18.1
Silica-free Ash ..	0.1	7.2	7.7	0.8	7.0	7.1
Lime (CaO) ..	1.67	1.45	1.23	1.63	1.33	1.19
Phosphoric Acid (P ₂ O ₅) ..	1.03	1.12	1.25	1.0	1.03	1.20

TABLE VI.—CENTRE—DORSET F. 2

Composition of Dry Matter Per cent.	Spring Herbage			Autumn Herbage		
	Land not Stocked with Poultry	Pens Treatment during Winter		Land not Stocked with Poultry	Pens Treatment during Summer	
		A. Rested	B. Stocked		A. Rested	B. Stocked
Crude Protein ..	13.1	13.6	18.1	11.2	13.2	17.4
Silica-free Ash ..	6.4	6.7	8.3	4.9	6.0	7.0
Lime (CaO) ..	1.54	1.57	1.44	1.30	1.21	1.24
Phosphoric Acid (P ₂ O ₅) ..	0.91	1.0	1.13	0.68	0.83	1.03

At two centres, where one group of pens is occupied during the winter months and another group during the summer, samples of the herbage were collected from all the pens in the spring and in the autumn. The mean composition of the herbage in the winter and summer groups of pens was calculated, and the data obtained is set out in Tables V and VI.

The pens were stocked at an average rate of 240 birds to the acre, and when the herbage samples were collected the pens grouped under "A" (Tables V and VI) had been

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occupied by poultry for periods varying from four to six weeks.

The tables provide information on the relative feeding value of the herbage of poultry pens after six months' rest and after six months' occupation.

A comparison of the protein contents of the three types of herbage indicated in the tables, shows that the influence of the nitrogen in poultry manure does not extend beyond a period of six months. Tables V and VI also show that after six weeks' occupation of the pens, the birds have not appreciably affected the composition of the herbage. This has, however, no great significance, since a response in the herbage can be obtained within three to four weeks under normal weather conditions provided that the birds are concentrated fairly intensively on the land for a short period (e.g., 1,000 birds moved over 1 acre of land in a fortnight).

Effect of Poultry on the Chemical Composition of the Soil. Fresh poultry manure has a composition that may vary according to the type of food fed and the purpose for which the birds are kept. Moreover, after deposition it may undergo a variable amount of drying and admixture with soil and litter, and, therefore, collected samples of poultry manure may vary widely in analysis. As a guide, however, the following average analysis may be quoted:³

						Per cent.
Moisture	..	..	∴	..	..	52.93
Organic Matter	..	..	..	..	..	29.30
Total Nitrogen	..	..	..	..	..	2.12
Total Potash (K ₂ O)	..	..	..	..	..	0.60
Total Phosphoric Acid (P ₂ O ₅)	..	..	..	..	..	1.21
Total Calcium Oxide (CaO)	..	..	..	..	..	1.16

It is estimated that 25 laying birds excrete annually about 18 cwt. of manure of the above composition. Under the folding system an acre of land, therefore, receives an annual dressing of 40 lb. nitrogen, equivalent to 1½ cwt. sulphate of ammonia; 24½ lb. phosphoric acid (P₂O₅), equivalent to 1½ cwt. superphosphate, and 12 lb. potash (K₂O), equivalent to 25 lb. sulphate of potash.*

* These calculations are based on the assumption that a laying bird excretes approximately 2 grammes of nitrogen per day and approximately 3½ oz. of manure of the composition quoted above.

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It follows that an acre of land on which 240 birds are penned will receive nearly five times this quantity of manure, if it be assumed that only 50 per cent. of the droppings are deposited in the pen. Thus, a laying-trial pen during six months' occupation receives manure equivalent to $4\frac{1}{2}$ cwt. sulphate of ammonia, $3\frac{1}{2}$ cwt. superphosphate, and $\frac{1}{2}$ cwt. sulphate of potash per acre.

This knowledge of the composition and quantity of manure deposited by a flock of poultry throws light on the changes in soil fertility that are observed when poultry are folded repeatedly or penned continuously on the same area of land.

Data illustrating the effect of poultry on a medium loam soil derived from the Keuper Marl formation are given in Table VII.

TABLE VII.—THE EFFECT OF PENNED POULTRY ON THE CHEMICAL COMPOSITION OF THE SOIL

	No Poultry	After 2 years Poultry	After 4 years Poultry	After 5 years Poultry
*Lime requirement (in cwt. of Calcium Carbonate per acre)	44.00	58.00	22.00	40.00
Available Phosphoric Acid (P_2O_5)% ..	0.011	0.013	0.056	0.063
Available Potash (K_2O)% ..	0.013	0.016	0.025	0.021

* The lime requirements were determined by the Hutchinson-McLennan method, and the available phosphate and potash by extraction with 1 per cent. citric acid (Dyer's method).

The lime requirement figures show that the original soil was deficient in lime to the extent of 44 cwt. calcium carbonate or approximately 1 ton quicklime per acre, and that in two years this deficiency had increased to 58 cwt. calcium carbonate per acre. An application of quicklime at the rate of 2 tons per acre in the third year considerably reduced the deficiency, but in the fourth year the lime requirement had risen to 22 cwt. and in the fifth year almost back to its original level.

Under the influence of poultry, lime is lost from this soil at an extremely rapid rate, and on sands and gravels there

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is an even greater tendency for lime to be leached from the surface soil.

The following calculation stresses the necessity for liming grass land under poultry:

If it be assumed that all the nitrogen in poultry manure is converted to nitrate, then a dressing of lime double the weight of nitrogen added in the form of poultry manure must be applied in order to maintain the supply of bases in the surface soil. This would mean that on land stocked with 250 head of laying birds per acre, approximately 800 lb. of burnt lime per acre would be required annually by the soil. Even this quantity of lime would appear to be insufficient, as it is necessary at most laying trials to apply burnt lime each year at the rate of 1 ton per acre.

The conclusion to be drawn from these data, and from field observations in general, is that frequent liming of poultry pens situated on acid soils should be a routine practice. It must also be stressed that when poultry are used to improve poor acid pasture, a full dressing of lime or limestone should be applied beforehand to obtain the full benefit of the manure and of the activities of the birds. This is borne out by a demonstration now being conducted in the West of England where poultry folded on acid pasture have grazed most closely on those strips of land that have received the full dressing of limestone (3 tons per acre) as determined by chemical analysis of the soil.

Data similar to those reported in Table VII have been obtained for soils from pens and folds on the Keuper Sandstone, Oolite, Gravel, and Lias formations, and the outstanding feature is the large increase in the available phosphoric acid in the surface soils after three years of poultry keeping; e.g., on Keuper Sandstone the available phosphate increased from 0.008 to 0.032 per cent. when poultry had been penned on the land three years, while, in the same period on Oolite, the available phosphate rose from 0.010 to 0.021 per cent.

An increase in the available potash was not always observed, and this soil constituent changed only in a very irregular manner. The effect of four or more years' continuous stocking with poultry is to cause the ratio of available phosphate to available potash to become abnormally high. This lack of balance has developed most strikingly in a chalk soil on which poultry had been established for over eight years.

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The pertinent data are given in Table VIII.

TABLE VIII.—THE "AVAILABLE" PLANT NUTRIENTS IN THE SOILS OF
OLD-ESTABLISHED POULTRY PENS

Plant Nutrient	No Poultry	Poultry for 8 years	
		Pens A	Pens B
Available Phosphoric Acid (P_2O_5)%	0·009	0·120	0·120
Available Potash (K_2O)% ..	0·010	0·007	0·004

The average ratio of available phosphate to potash in this soil is 20 to 1, whereas in a good type of grass land soil the ratio is approximately 3 to 2 (i.e. $P_2O_5 = 0\cdot03$ per cent., $K_2O = 0\cdot02$ per cent.), although the ratio may be as high as 7 to 1 before the effects of the imbalance become appreciable. The condition in this soil is very similar to that observed by Blenkinsop⁴ in potato-sick soils in Devon and Cornwall, and further investigation may reveal that the same condition exists in all soils on which poultry have been kept intensively for eight or more years, and in soils that have sometimes been termed "poultry-sick." If so, the remedial treatment would be the application of a relatively heavy dressing of potash, e.g., 3 cwt. per acre of sulphate of potash or its equivalent, supported by severe harrowing, and, where the condition is extreme, a repetition of this treatment would probably be necessary in the succeeding year. Since the phosphate accumulates in the top few inches of soil, the most satisfactory treatment might be to plough up the pasture, apply potash and re-seed.

The high content of available phosphate in this soil was reflected in the high phosphoric acid content of the herbage, the average being 1·14 per cent. of the dry matter. This value is approached only on the best pastures when the herbage is kept closely grazed, while the dry matter of herbage on a good average pasture would contain not more than 0·8 per cent. of phosphoric acid.

Poultry and Grass Land Management. The combined management of poultry and grass land presents problems both to the specialist poultry farmer and to the grass land farmer, but whereas the former is concerned solely to provide range and green food for the birds, the latter is concerned

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with poultry also as a means of manuring and improving the land. Their problems will, therefore, differ.

In order to provide suitable range and green food for poultry, a dense sward of young, leafy grass must be maintained, and it is this object that the poultry farmer should seek to attain in the management of his grass land, whether it be used for permanent runs or for movable houses and folds. Poor land freshly stocked with poultry would require a dressing of phosphates and potash (e.g., 6 cwt. basic slag and 3 cwt. kainit per acre) to encourage the growth of good grasses and clovers.

The high nutritive value of young grass is now well established, but it is necessary to stress the fact that poultry, and young birds especially, can obtain little or no benefit from the long, coarse grasses and weeds that so commonly provide the herbage on fields where poultry are said to be "out on grass." Moreover, short herbage is desirable from the hygienic point of view since—as Taylor at Weybridge has pointed out—the excreta of birds, when deposited on short grass, are exposed to the drying action of air and sun, and are, therefore, given an opportunity to dry out before the larvae of those parasitic worms which have no intermediate host have reached the more infective stage.

In the management of poultry runs, the farmer is faced with the special problem of maintaining a sward on land stocked for six months and frequently throughout the entire year, at the rate of 200 to 400 birds per acre. This means that the land is treated excessively with an unbalanced manure. The immediate effect of this manuring is to stimulate an excessive growth of summer grass, making it necessary to mow or graze more frequently than would otherwise be necessary. The second effect is to bring about adverse changes in the soil, with subsequent deterioration of the turf. The nature of these soil changes has been described, but, to prevent or counter them, an annual application of lime (at the rate of $\frac{1}{2}$ to 1 ton per acre) is required, and also potash (at the rate of 3 cwt. of kainit per acre) once in every four years in order to maintain a balance with the phosphates added to the soil by the fowls.

For the simple improvement of poor land, the folding of 25 birds over one acre of land in a year has proved satisfactory, and it is important to note that, under this system of light stocking, wild white clover is encouraged, and not dis-

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couraged as it is under the intensive stocking of pens. The actual number of birds required, however, for the improvement of one acre of land will naturally vary inversely with the frequency it is desired to run poultry over the same land. Thus, if the land is to be treated once in four years, it would probably be sufficient to run 100 laying birds over one acre of land in the course of twelve months.

Acid land must be limed if the full benefit of the treatment with poultry is to be obtained, and, when poultry are repeatedly run over the land, dressings of potash must be periodically applied.

When poultry are to be housed in small portable folds, the birds should not be overcrowded, and the number should therefore not exceed 15 adult birds per unit measuring 20 ft. \times 5 ft. Even this number allows only slightly over two-thirds of a square yard per day. This means extra outlay on folds, but it would probably be offset by the lower mortality and better health of the birds. It would also mean that the birds must be moved twice or three times over the same land in twelve months to obtain sufficient manure on the land. This could be done without difficulty on light dry land.

Like the folding of pigs and the "bail" system of dairy farming, the folding of poultry has provided an excellent means of increasing the productivity of Down pastures. The value of this system on other types of light land, both pasture and arable, is now well recognized, but it may not be so well recognized that the manure from a large flock of poultry is a valuable source of nitrogen, which exists in a fairly quick-acting form. The manure from a large flock of laying birds would enable a considerable reduction to be effected in the expenditure on nitrogenous fertilizers applied to grass land to stimulate the growth of an early spring bite. Thus, a flock of 1,000 laying birds moved systematically over one acre of grass land in a fortnight would deposit manure equivalent to $2\frac{1}{2}$ cwt. sulphate of ammonia (as well as $2\frac{1}{2}$ cwt. superphosphate and 40 lb. sulphate of potash).

Two points concerning the nitrogen in poultry manure must be borne in mind. It is somewhat slower and steadier in action as compared with the nitrogen of sulphate of ammonia, and its efficiency is only about 70 per cent. of the latter. This value for the efficiency of nitrogen in poultry manure has been deduced from experiments recently conducted with this manure in the West of England and elsewhere.

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Finally, attention may be drawn to the need for information regarding the influence of poultry on the hay crop. It is a frequent custom to fold or run poultry during the winter months over land that is to be mown for hay. There appear to be no data published on the effect of this treatment on the subsequent yield, and such data are urgently required, since it is a matter of economic interest both to the specialist poultry farmer and to the general farmer.

In this brief survey an endeavour has been made to discuss the more important problems concerning the management of grass land in relation to poultry husbandry. Where possible, suggestions have been made, but these must be regarded as tentative pending investigations on a wider basis.

ACKNOWLEDGMENTS.—The collection of the samples of herbage from the County Egg-Laying Trials was carried out by Major Eden of the Ministry of Agriculture and the County Agricultural Organizers and their staffs. To them the writers' thanks are due.

REFERENCES.

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2. Wilts C.C. Advisory Report, April, 1936, pp. 87-97.
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BEET SUGAR INDUSTRY IN 'GREAT BRITAIN :

FINANCIAL POSITION OF THE FACTORY COMPANIES

THIS article reviews the financial position of the 15 beet sugar manufacturing companies as at March 31, 1936, and the trading results of the 18 factories operated by the companies in the 1935-36 campaign. The information given is supplementary to that contained in the "Report on the Sugar-Beet Industry at Home and Abroad,"* relative to the 1924-25 to 1929-30 campaigns, and in articles in the February, 1932, March, 1933, February, 1934, May, 1935 and March, 1936, issues of this JOURNAL, relative to the 1930-31, 1931-32, 1932-33, 1933-34 and 1934-35 campaigns respectively. As explained in an article in the May, 1936, issue of the JOURNAL (pages 141-145), the 15 factory companies have now been amalgamated into the British Sugar Corporation, Ltd., under the provisions of the Sugar Industry (Reorganization) Act, 1936, and this is accordingly the final article of the series dealing with the companies that are now being wound up. As regards the future, certain accounts of the British Sugar Corporation will be included in the annual reports of the Sugar Commission.

Table I (see Table 67 and Appendix H of the Sugar-Beet Report) summarizes the combined balance sheets of all the companies and shows their financial position as at March 31, 1936, together with comparable figures for the previous year. Reserves and credit balances on Profit and Loss Account amount to £1,591,737, of which £251,122 was appropriated for payment of dividends, equal to 5·5 per cent. on the total share capital. The large reduction in reserves and cash balances is attributable in the main to a distribution of £740,000 as cash bonus to shareholders subsequent to March 31, 1935. Pending completion of the winding-up arrangements, certain companies have not distributed any dividends in respect of the year, and the balance to be carried forward into liquidation amounts to £1,340,615. Dividend payments in the previous year amounted to £513,762, or 11·3 per cent., and in 1933-34 to £370,392, or 8·3 per cent.

* Economic Series No. 27 : H.M. Stationery Office, 1931. (Out of print.)

BEET SUGAR INDUSTRY IN GREAT BRITAIN

TABLE I.—SUMMARY OF BALANCE SHEETS OF BRITISH BEET SUGAR FACTORY COMPANIES AS AT MARCH 31, 1935 AND 1936

	As at March 31		Increase or Decrease
	1935	1936	
	£	£	£
<i>Liabilities :</i>			
Share Capital	4,550,954	4,550,954	—
Mortgages and Debentures ..	1,319,017	1,261,517	— 57,500
Bank and other Loans ..	453,848	783,142	+ 329,294
Sundry Creditors and Out-standings	1,187,445	960,203	— 227,242
Reserves*	1,557,483	762,918	— 794,565
Profit and Loss Balances before appropriation of Dividends <i>less</i> Deficits ..	907,207	828,819	— 78,388
Total Liabilities ..	9,975,954	9,147,553	— 828,401
<i>Assets :</i>			
Beet Sugar Factories & Equipment <i>less</i> Depreciation ..	5,113,757	5,214,695	+ 100,938
Investments	966,028	822,142	— 143,886
Stocks and Stores	1,784,860	1,885,972	+ 101,112
Sundry Debtors & Prepayments	760,674	627,169	— 133,505
Cash Balances	1,350,635	597,575	— 753,060
Total Assets	9,975,954	9,147,553	— 828,401

* Including capital reserves ; also a special reserve of £10,000 in 1935.

The position in regard to capital expenditure on factories and equipment to March 31, 1936, is as follows:—

	£	£
Total expenditure		9,369,916
Less : Depreciation	4,001,933	
Written off on reconstruction ..	153,288	
	<u>4,155,221</u>	
Balance as per Table I		<u>5,214,695</u>

Investments amounted to £822,142 of which £667,138 was invested in associated companies, as compared with £966,028 and £777,350 in 1934-35, and £854,501 and £769,325 in 1933-34. The capital cost per ton of beet worked was £2.75 as against £2.25 in the 1934-35 campaign and £2.7 in 1933-34.

Table II (see Table 70 and Appendix F of the Sugar-Beet Report) has been compiled from data supplied by the factories, and shows, as compared with the previous year, the manu-

BEET SUGAR INDUSTRY IN GREAT BRITAIN

TABLE II.—MANUFACTURING COSTS AND OVERHEAD CHARGES OF BRITISH BEET SUGAR FACTORIES FOR THE CAMPAIGN YEARS 1934-35 AND 1935-36. TOTAL AND PER TON OF BEET WORKED.

	1934-35		1935-36		Increase or Decrease per ton of beet
	Total	Per ton of beet	Total	Per ton of beet	
	£	s. d.	£	s. d.	d.
Coal and coke	503,156	2 5	495,219	2 5	—
Limestone	100,192	0 6	81,200	0 6	—
Bags	269,043	1 4	214,045	1 3	— 1
Other manufacturing supplies	112,268	0 6	97,175	0 7	+ 1
Repairs and maintenance	201,526	1 0	157,428	0 11	— 1
Salaries and wages ..	784,817	3 10	713,054	4 2	+ 4
Rates and insurance ..	54,384	0 3	56,771	0 4	+ 1
Other general charges ..	96,170	0 6	110,396	0 8	+ 2
Beet expenses	181,548	0 11	133,098	0 9	— 2
Total	2,303,104	11 3	1,968,386	11 7	+ 4

facturing costs and overhead charges under the main sub-heads of expenditure in total and per ton of beet worked. The total cost per ton of beet was 4*d.* more than in 1934-35 but 4*d.* less than in 1933-34.

Table III (see Table 91 and Appendices F & G of the Sugar-Beet Report) summarizes the trading and profit and loss accounts for the financial years ended March 31, 1936 (1935-36 campaign), and March 31, 1935 (1934-35 campaign). The total income from products in 1935-36, after deducting Excise Duties, but before crediting subsidy, was £6,753,648 or 39*s.* 8*d.* per ton of beet, as against £7,699,354 or 37*s.* 7*d.* in the previous year and £6,152,264 or 37*s.* 3*d.* in 1933-34. Under the Sugar Industry (Reorganization) Act, 1936, the sum of £2,218,147 in respect of subsidy for 1935-36 is due to be supplemented by allowances for interest on capital, not exceeding in the aggregate £315,000. These allowances accrue to the transferor companies, but as the exact amount had not been determined by March 31, 1936, it was impossible to include them in the profit and loss accounts for the year. The cost of sugar-beet, £6,609,412, represented 74 per cent. of the net total factory income from products including subsidy, an increase of 6 per cent. over each of the two previous years. The net profit on beet trading equalled 2*s.* 4*d.* per ton of beet worked and on subsidiary industries 1*s.* 3*d.* per ton, making

BEET SUGAR INDUSTRY IN GREAT BRITAIN

TABLE III.—BRITISH BEET SUGAR FACTORY INCOME, EXPENDITURE AND PROFITS FOR THE YEARS ENDED MARCH 31, 1935 AND 1936. TOTAL OF ALL FACTORIES AND AVERAGES PER TON OF BEET WORKED.*

	Total		Per ton of beet	
	1934-35	1935-36	1934-35	1935-36
	£	£	s. d.	s. d.
<i>Income, Expenditure and Profits :</i>				
Net income from sugar (less				
Excise Duty)	6,358,985	5,569,069	31 1	32 9
Molasses	107,564	82,659	0 6	0 6
Pulp	1,231,576	1,100,373	6 0	6 5
Lime sludge	1,229	1,547	—	—
Total income from saleable products	7,699,354	6,753,648	37 7	39 8
Add Subsidy	4,509,488†	2,218,147	22 0	13 1
Total income	12,208,842	8,971,795	59 7	52 9
Less cost of beets	8,342,966	6,609,412	40 9 (68%)	38 10 (74%)
Balance to factories	3,865,876	2,362,383	18 10 (32%)	13 11 (26%)
Less manufacturing costs and overhead charges	2,303,104	1,968,386	11 3	11 7
Beet trading profit	1,562,772	393,997	7 7	2 4
Profit on subsidiary industries	117,487	219,410	0 7	1 3
Total profit	1,680,259	613,407	8 2	3 7
<i>Appropriations of Profits :</i>				
Interest charges (net)	32,525‡	42,878	0 2	0 3
Directors' Fees	36,749§	31,305	0 2	0 2
Depreciation and writing-down	354,978	85,399	1 9	0 6
Income Tax	236,093	57,655	1 2	0 4
Dividends	513,762	251,122	2 6	1 6
Reserved	281,657	4,000	1 4	—
Total Appropriations	1,455,764	472,359	7 1	2 9
Appropriations from Reserve	—	44,563	—	0 3
Unappropriated Balances || .. .. .	1,455,764	427,796	7 1	2 6
	224,495	185,611	1 1	1 1
	1,680,259	613,407	8 2	3 7

* The figures are based on the confidential trading and profit and loss accounts of all the companies.

† Including in 1934-35 £83,247 advances under the British Sugar Industry (Assistance) Act, 1931, brought into account. Of this sum £28,574 was not in fact brought into the profit and loss accounts, being

(Notes to Table III continued at top of next page)

BEET SUGAR INDUSTRY IN GREAT BRITAIN

applied direct to general reserves, but, for the sake of convenience in the preparation of the above table, this sum has been included in the total of £83,247 and also in the figure of £281,657 for Appropriations to Reserves.

‡ After deducting £35,000 profit on sale of investments.

§ Including £1,360 special Directors' Fees paid out of Profit and Loss balances.

|| Representing :—

		1934-35	1935-36
		£	£
Increase in credit balances	..	122,658	184,860
Decreases in debit balances	..	101,837	751
		<hr/> 224,495	<hr/> 185,611

a total net profit for the year's trading of 3s. 7d. per ton. In 1934-35, the corresponding figures are profits of 7s. 7d. and 7d., totalling 8s. 2d. per ton; and, in 1933-34, profits of 6s. 11d. and 6d. totalling 7s. 5d. per ton. The total profit in 1935-36 was, therefore, 4s. 7d. per ton lower than in 1934-35, and 3s. 10d. per ton lower than in 1933-34.

The appropriations of the profits from the year's trading amounted to £472,359, which, after taking into account £44,563 appropriated from reserves, left a balance of £185,611 to be carried forward. The figure of £85,399 for depreciation in 1935-36, which includes £23,399 written-off, is not comparable with the figure of £354,978 in respect of 1934-35, since, under the Sugar Industry (Reorganization) Act, 1936, a sum of £240,000 has been paid to the British Sugar Corporation, Ltd., in respect of depreciation in 1935-36, and full provision was accordingly not made by the transferor companies. As mentioned above, certain companies, in view of the pending winding-up, made no provision for dividend distribution, and for the same reason it was unnecessary to make any appropriations to reserve with the exception of special reserves unaffected by the amalgamation.

The quantity of beet worked at the factories in the 1935-36 campaign was 3,403,989 tons (washed and topped weight), and the duration of the campaign 98 days, comparing with 4,094,707 tons and 122 days in 1934-35, and 3,298,119 tons and 107 days in 1933-34. The average daily through-put of beet was 34,735 tons in 1935-36, 33,563 tons in 1934-35, and 30,824 tons in 1933-34. The production of sugar, expressed in terms of commercial white sugar as calculated in accordance with the provisions of the Sixth Schedule to the Sugar Industry (Reorganization) Act, 1936, was 471,704 tons against 593,189 tons in 1934-35 and 450,605 in 1933-34.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for December, 1936, are given below, with comparative figures for November, 1936, and December, 1935. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contributions		
	Dec. 1936 d.	Nov. 1936 d.	Dec. 1935 d.	Dec. 1936 d.	Nov. 1936 d.	Dec. 1935 d.
Northern	14	13½	13½	2½	3½	3½
North-Western	14	13½	13½	2½	3½	3½
Eastern	14½	13½	14	2½	2½	2½
East Midland	14½	13½	13½	2½	3½	2½
West Midland	14	13½	13½	2½	3½	3½
North Wales	14	13½	13½	2½	3½	3½
South Wales	14	13½	13½	2½	3½	3½
Southern	14½	14	14	2½	2½	2½
Mid-Western	14	13½	13½	2½	3½	3½
Far-Western	13½	13½	13	2½	3½	3½
South Eastern	14½	14½	14½	2½	2½	2½
Unweighted Average ..	14·14	13·55	13·55	2·52	3·03	3·03

These prices are exclusive of any premiums for special services and level deliveries, and also of the accredited producers' premium of 1d. per gal.

The number of producers who qualified for the accredited premium was 20,080 and the sum required for the payment of the premium was equivalent to a levy of 350d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal., compared with 1¾d. per gal. in December, 1935. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Dec., 1936 (estimated) Gal.	Dec., 1935 Gal.
Liquid	47,302,947	46,188,275
Manufacturing	16,310,319	20,063,149
	<hr/> 63,613,266	<hr/> 66,251,424
Percentage liquid sales	74·36	69·72
Percentage manufacturing sales	25·64	30·28

MARKETING NOTES

The average realization price of manufacturing milk during December was 6·25*d.* per gal., compared with 6·17*d.* per gal. for December, 1935. The quantity of milk manufactured into cheese on farms was 428,146 gal., compared with 702,329 gal. in November, and 379,217 gal. in December, 1935.

Inquiry into Objections to Amendments. The public inquiry into objections to the amendments of the Milk Marketing Scheme, which was conducted by Mr. N. L. C. Macaskie, K.C., was concluded on January 11. The inquiry lasted for 29 days in all, of which 9 days were occupied by the hearing of the special case of the producers of tuberculin tested milk.

Pigs and Bacon Marketing Schemes. Following the cancellation of the pig contracts for 1937, the Pigs and Bacon Marketing Boards, and, subsequently, the Bacon Development Board, discussed the desirability of continuing some system of control over the marketing of bacon pigs. It is understood that proposals for the future organization of the industry and also for the arrangements to be adopted in the meantime are under examination.

Hops Marketing Scheme: Trading in the 1936 Crop. Valuation of the 1936 hop crop was delayed owing to weather conditions. Trading in the crop was, however, begun on January 6 (compared with January 15 last year). During the first 28 days of trading, hops may be offered and sold only to merchants nominated by brewers who have entered into a firm contract with the Hops Marketing Board. The Board have made further payments to growers of sums sufficient to make up, with previous payments, approximately two-thirds of the estimated valuation of their quota hops.

American Hops. In 1935, the American hops crop was considerably in excess of the home demand, and there was an export trade to this country at prices ranging from £8 to £10 per cwt. (duty of £4 per cwt. paid). These prices were below the cost of production, and a certain amount of grubbing took place. Climatic conditions for the 1936 crop were unfavourable, and the crop was abnormally small, but on the whole good in quality. In consequence, the prices of American hops during 1936 ranged from £15 10*s.* to £17 per cwt. (duty paid). Under the five-year agreement between the Hops Marketing Board and the Brewers' Society, the prices of English hops have remained at the agreed average of

MARKETING NOTES

£9 per cwt., and, during the past two years, production has not varied to any appreciable extent.

Wheat Act, 1932: *Sales of Home-grown Wheat, Cereal Year, 1936-37.* Certificates lodged with the Wheat Commission by registered growers during the period August 1, 1936, to January 8, 1937, cover sales of 11,734,687 cwt. of millable wheat as compared with 18,670,295 cwt. in the corresponding period (to January 10) in the last cereal year.

Appointment of Member of Wheat Commission. The Minister of Agriculture and Fisheries and the Secretaries of State for Scotland and the Home Department have appointed Mr. J. H. Pillman, of 11, Hart Street, Mark Lane, London, E.C.3, to be a member of the Wheat Commission representing the interests of importers of flour, vice Mr. F. T. Collins, deceased.

Milk Acts, 1934 and 1936 : Manufacturing Milk. Advances made by the Ministry up to January 15, 1937, in respect of manufacturing milk were as follows:—

Section of Act		Period of Manufacture	Quantity	Advances
1	(a) <i>Milk Marketing Board for England and Wales.</i> In respect of Milk : Manufactured at factories other than the Board's	April, 1934, to Oct., 1936	Gallons 475,801,922	£ 2,139,379
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
	* Total for England and Wales ..		514,431,100	2,339,692
6	(b) <i>Government of Northern Ireland.</i> In respect of milk : Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936	60,168,430	359,021
	TOTAL ..		574,599,530	2,698,713

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk sold for manufacture in these months.

Milk-in-Schools Scheme. The following table, which has been compiled from claims submitted by the Milk Board up

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to January 15, 1937, shows the gallonage consumed and the corresponding Exchequer grants for each month during the first two years of the Scheme. Further returns will slightly increase the figures for the second year, but the increase is expected to be less than two per cent.

	1934-35		1935-36	
	Gallons	Payment	Gallons	Payment
		£		£
October	1,972,077	41,050	2,273,153	52,090
November	2,448,779	50,977	1,951,474	44,720
December	1,771,961	40,568	1,562,675	35,808
January	2,174,789	49,779	1,901,097	43,562
February	2,347,678	53,733	2,050,748	46,990
March	2,388,657	49,688	2,303,877	52,772
April	1,648,874	34,261	1,545,931	32,172
May	2,246,518	27,843	2,140,537	26,691
June	1,585,814	16,639	1,797,910	22,190
July	1,833,392	13,369	1,766,683	16,788
August	449,887	3,280	469,141	3,421
September	1,983,923	20,666	2,084,995	19,547
	22,852,349	401,853	21,848,221	396,751

General Publicity. A further scheme submitted by the Milk Marketing Board on the recommendations of its Advisory Committee on Milk Publicity has been approved. It follows the lines of those conducted during 1935 and from February to November, 1936. Of the total estimated cost of £60,000, the major portion will be devoted to a Press and poster campaign covering the period November, 1936, to September, 1937. The Scheme was drawn up in consultation with the National Milk Publicity Council and its main activities will link up with the work of that Council, particularly as regards the "Milk in Industry Campaign," designed to encourage the consumption of milk in factories, workshops and offices.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer), in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 541 pence per lb. for the month of January, 1937.

Experimental Cheap Milk Schemes in the Special Areas: Jarrow. A scheme for the supply of milk at 2d. per pint to

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expectant and nursing mothers and to children under school age was inaugurated at Jarrow on January 1. The scheme, which is similar to that operating in the Rhondda Valley (see below), has been made possible by the co-operation of the Milk Marketing Board, the Commissioner for the Special Areas, the Jarrow Borough Council, and the local milk distributors. As in the Rhondda Scheme, each consumer in the three categories is allowed a minimum of one pint per day at the reduced price. There is no means test of any kind and the milk is delivered to the consumer's house in pint bottles. Under the scheme, distributors accept a reduced margin of 8d. per gal. and the Milk Marketing Board and the Commissioner for the Special Areas each contribute half the amount necessary to enable the milk to be sold at the reduced price.

Rhondda. A note on this scheme appeared on page 575 of the issue of this JOURNAL for September, 1936. Recent returns show that on December 12, 1936, there were 4,386 persons, of whom more than 3,400 were children under school age, availing themselves of the facilities offered, while the total consumption of milk for the week ended on that date was 24,000 pints. Enquiries initiated by the Milk Board have shown that, prior to the inception of the scheme, the milk consumption in the families now benefiting under it was lower than the average consumption for the whole district. Thus, in 350 of the families concerned, no fresh milk was purchased in the week prior to the entry into the Scheme, while in 800 families the per capita consumption was less than one pint per person per week or one-seventh of a pint per day.

Sugar Industry (Reorganization) Act, 1936: *Production of Sugar from Home-grown Beet during 1936-37 Campaign.* According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during December, 1936, and the corresponding month in 1935, were:—

				<i>White Cwt.</i>	<i>Raw Cwt.</i>	<i>Total Cwt.</i>
1936	..	..	..	1,512,186	1,701,007	3,213,193
1935	1,202,047	1,557,671	2,759,718

The total quantities of sugar produced to the end of

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December in each of the two manufacturing campaigns were:—

	<i>White Cwt.</i>	<i>Raw Cwt.</i>	<i>Total Cwt.</i>
Campaign, 1936-37 ..	4,647,203	4,558,873	9,206,076
„ 1935-36 ..	3,987,995	4,889,822	8,877,817

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	1936 April 1 to Dec. 31	1935 April 1 to Dec. 31	Sept. 1,* 1934, to Dec. 31, 1936
Payments	£2,946,416	£2,809,566	£8,843,729
Animals in respect of which payments were made ..	1,259,414	1,188,147	3,736,471
Average payment per animal	£2 6 10	£2 7 3	£2 7 4
Imported animals marked at Ports (Great Britain only)	444,643	347,366	1,187,795†

* Commencement of subsidy payments.

† As from August 6, 1934.

Fat Stock: Carcass Sale by Grade and Dead-Weight. During the past year 11,834 cattle, 35,709 sheep, and 9,440 pork pigs were dealt with under the Grade and Dead-Weight Scheme, as compared with 10,573 cattle, 27,669 sheep, and 7,262 pork pigs in 1935. All the centres under the Scheme were well supported.

The following table shows the grading of the carcasses dealt with in 1936:—

	Carcass Grade				Rejected	Total
	Super *	I	II	III		
<i>Cattle :</i>						
Bullocks & heifers	52	3,003	6,472	952	127	10,606
Other classes ..	—	300	608	234	86	1,228
<i>Sheep :</i>						
Lambs	—	10,910	11,960	3,006	1,437	27,313
Other sheep ..	—	4,488	2,846	751	311	8,396
<i>Pigs :</i>						
Pork pigs & sows	—	4,969	3,738	628	105	9,440

* This grade is for bullocks and heifers only.

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It will be seen that 41·6 per cent. of the carcasses qualified for Grade I (including Super-grade), 45 per cent. for Grade II, and 9·8 per cent. for Grade III. Only 1·8 per cent. of the cattle, 4·9 per cent. of the sheep, and 1·1 per cent. of the pigs were rejected as ungradable under the Scheme. Up to May 1, 1936, all ungradable carcasses were sold on commission. With the object of eliminating commission sales as far as possible, the Conditions of Sale were altered on that date so as to provide that ungradable carcasses shall be sold at prices agreed with the purchaser by the Ministry's Head Grader, or failing agreement, shall be sold on commission. Since the date indicated 1,592 animals have been rejected, of which 1,501 were sold at agreed prices, and 91 on commission.

The Scheme was introduced in March, 1930, and the total stock dealt with to December 31, 1936, comprised 9,990 consignments consisting of 31,964 cattle, 101,454 sheep, and 18,217 pigs.

National Mark Beef. From October, 1929, when the Scheme was introduced, to December 31, 1936, over two million sides of beef were graded and marked with the National Mark. During the past year, the Mark was applied to 382,274 sides, of which 48·5 per cent. were "Select," 50·0 per cent. "Prime," and 1·5 per cent. "Good."

The number of sides marked in 1936 was 50 per cent. more than in 1930.

British Industries Fair. The Ministry is staging an exhibit of National Mark products at the British Industries Fair, which is to be held at Olympia from February 15 to 26. The display will include canned and bottled fruit and vegetables; fruit-juice syrups; honey, cider and perry; Cheshire, Cheddar, Stilton and other home-produced cheese; creamery butter; wheat flakes; and such fresh fruits and vegetables as are in season. Samples of various National Mark products will be on sale, and a full range of the Ministry's publications will be available at the stand.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1936*

Produce of Crops

THE areas under barley, oats, mixed corn and peas, as returned in June, 1936, were greater than those returned for these crops in June, 1935, but acreages of other crops were smaller than in the previous year. The area under seeds hay was also below that in 1935, but meadow hay showed a slight increase in area.

With the exceptions of mixed corn, beans, and root crops, yields per acre were lower than in 1935. The estimated total production of barley, mixed corn, turnips and swedes and mangolds was greater than in 1935, but lower figures were recorded for wheat, oats, hay, and potatoes. The estimated production of wheat in 1936 was 15 per cent. below that of the previous year. Production of turnips and swedes showed an increase of over 21 per cent.

Only meadow hay and root crops, other than potatoes, showed in 1936 a higher yield per acre than the average for the previous ten years.

Corn Crops : *Wheat.* The area under wheat in 1936 was 1,704,469 acres, or 4 per cent. below that in 1935, and the estimated yield per acre was 16·2 cwt. compared with 18·3 cwt. in 1935. The result of these reductions was that the total production declined from 1,623,000 tons in 1935 to 1,378,000 tons in 1936, a reduction of 245,000 tons, or 15 per cent. In all English counties except Lancashire and those in the extreme north, yields were below those of the average for the preceding ten years. The yield of 16·2 cwt. per acre for the whole of England and Wales was 1·5 cwt. below the ten years average.

Barley. An increase of 27,279 acres occurred in the area devoted to this crop. The lower yield per acre, 16·2 cwt. compared with 16·6 cwt. in 1935, was more than offset by the increased area, and total production rose by 7,000 tons to 663,000 tons. The figure of 16·2 cwt. per acre for yield over the whole country was lower by 0·1 cwt. than the average for

* This return was published on January 1, 1937.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE CORN, HAY AND ROOT CROPS IN ENGLAND AND WALES IN 1936, WITH COMPARISONS FOR 1935, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1926-1935.

Crops	Estimated Total Produce		Acreage		Estimated Yield per Acre		
	1936	1935	1936	1935	1936	1935	Average of the Ten years 1926-1935
	Thousands of Tons	Thousands of Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
Wheat	1,378	1,623	1,704,469	1,772,284	10·2	18·3	17·7
Barley	663	656	818,924	791,645	16·2	16·6	16·3
Oats	1,080	1,138	1,419,695	1,418,356	15·2	16·0	15·8
Mixed Corn ..	75	71	96,994	93,320	15·4	15·3	15·7
Seeds Hay*	1,674	1,795	1,338,849	1,385,591	25·0	25·9	26·9
Meadow Hay†..	4,733	4,842	4,668,812	4,642,704	20·3	20·9	19·7
Beans for Stock-feeding or Seed	93	93	121,174	133,334	15·3	13·9	16·4‡
Peas for Stock-feeding or Seed	31	31	45,822	42,406	13·4 Tons	14·8 Tons	14·8‡ Tons
Potatoes ..	2,814	2,879	456,569	462,796	6·2	6·2	6·4
Turnips and Swedes ..	5,579	4,590	447,968	493,255	12·5	9·3	11·7
Mangolds ..	4,685	4,567	245,250	249,866	19·1	18·3	18·7

* Hay from Clover, Sainfoin and Grasses under rotation.

† Hay from Permanent Grass.

‡ Peas and Beans harvested as Corn up to 1934.

the preceding ten years, and in approximately two-thirds of the counties in England and Wales reduced yields were recorded. Cambridge, Hertford, and Glamorgan were noteworthy as showing yields estimated at more than 1 cwt. above the ten years average.

Oats. The total acreage under oats was slightly larger than that in 1935, 1,419,695 acres against 1,418,356 acres. The yield per acre, however, was estimated at 15·2 cwt. compared with 16 cwt. in 1935, and the total production consequently decreased by 58,000 tons to 1,080,000 tons, a reduction of 5 per cent. The figure of 15·2 cwt. was 0·6 cwt. below that of the average of the previous ten years, and all divisions of England and Wales except the North-Western showed declines from the average yields of the period 1926-35.

Mixed Corn. There was an increase in acreage from 93,320 in 1935 to 96,994 in 1936, and the yield per acre was estimated at 0·1 cwt. higher, at 15·4 cwt. The total production in England and Wales was estimated at 75,000 tons as against 71,000 tons in 1935, an increase of nearly 6 per cent.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

Though larger than in 1935, the yield of 15·4 cwt. per acre was less by 0·3 cwt. than the average of the preceding ten years, all divisions, except the North Western and South Wales showing decreases.

Beans. The crop dealt with is that harvested for stock-feeding or for seed. The area in 1936 fell by 12,160 acres to 121,174 acres, but the estimated yield per acre rose from 13·9 cwt. to 15·3 cwt., and the total production remained the same at 93,000 tons.

Peas. As with beans, the figures for peas relate to the crop harvested for stockfeeding or for seed. The area under peas rose from 42,406 acres in 1935 to 45,822 acres in 1936, but the estimated yield per acre fell by 1·4 cwt. to 13·4 cwt., and the total production in England and Wales remained unchanged at 31,000 tons.

Hay. The rains in June were favourable to growth, but they continued during July and harvesting was much hampered. In many districts it was not completed by the end of August, and much of the crop was seriously damaged.

Seeds Hay. The area under clover, sainfoin, etc., for hay was returned in 1936 at 1,338,849 acres against 1,385,591 acres in 1935. This decline, coupled with a reduction of 0·9 cwt. in the yield per acre, resulted in a smaller total production. This was estimated at 1,674,000 tons, compared with 1,795,000 tons in 1935, a decrease of 7 per cent. The yield of 25·0 cwt. per acre was nearly 2 cwt. below the ten years average, and all divisions of England and Wales showed yields below average, although thirteen individual counties, including Suffolk and three around London, showed increases.

Meadow Hay. The acreage under permanent grass for hay in 1936 was 4,668,812 acres, or 26,108 acres more than in the previous year. The yield per acre, however, was estimated at 20·3 cwt. as against 20·9 cwt. in 1935, and the total production for the country decreased from 4,842,000 tons to 4,733,000 tons, a fall of just over 2 per cent. The yield per acre over the whole country was 0·6 cwt. in advance of the ten years average of 19·7 cwt. and the two Midland divisions were notable in showing yields in all counties above the ten-year averages.

Potatoes. The area devoted to potatoes showed a reduction in 1936 for the third year in succession, the acreage being returned at 456,569, as compared with 462,796 in 1935. The

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

estimated yield per acre at 6·2 tons showed no change from that of 1935, and the total production fell from 2,879,000 tons to 2,814,000 tons, a reduction of 2 per cent. As against the average yield per acre of the preceding ten years, the yield in 1936 showed a reduction of 0·2 tons.

The figures given above relate to seeds and chats as well as ware potatoes, and also include both first and second earlies as well as the main crop.

Roots : Turnips and Swedes. The area under these roots has shown a continued reduction in recent years, and the decline between 1935 and 1936 was from 493,255 to 447,968 acres. The estimated yield per acre, however, at 12·5 tons was exceptionally high and, despite the smaller acreage, the total production for England and Wales rose by 21 per cent. from 4,590,000 tons in 1935 to 5,579,000 tons in 1936. The yield per acre was above the ten years average figure by 0·8 tons per acre, and most divisions in England contributed to this increase. The Northern division, which comprises Northumberland, Durham and the North and West Ridings of Yorkshire, gave a yield nearly 2 tons per acre above the ten years average, but, with one exception, all the Welsh counties showed decreases.

Mangolds. Only 245,250 acres were returned as being under this crop in 1936, compared with 249,866 acres in 1935. The average yield per acre at 19·1 tons, however, was estimated at 0·8 tons higher than in the previous year, and the total production in England and Wales increased from 4,567,000 tons in 1935 to 4,685,000 tons in 1936. The yield of 19·1 tons per acre was 0·4 tons above the average of the ten years 1926-1935, and this improvement was, on the whole, general throughout England and Wales.

Sugar-Beet. The area under this crop was 348,147 acres compared with 366,698 acres in 1935. The average yield per acre of washed and topped beet is provisionally estimated at 9·4 tons, or 0·3 tons higher than in 1935.

Produce of Hops.* Preliminary statement showing the estimated total production of hops in the years 1936 and 1935, with the acreage and estimated average yield per statute acre in each county of England in which hops were grown; and the average yield per acre of the ten years 1926-35.

* This return was published on January 14, 1937.

AGRICULTURAL RETURNS, 1936: PRODUCE OF CROPS

Counties, etc.	Estimated Total Produce		Acreage returned in June		Estimated Average Yield per Acre		
	1936	1935	1936	1935	1936	1935	Average of the 10 years, 1926-1935
	Cwt.	Cwt.	Acres	Acres	Cwt.	Cwt.	Cwt.
Kent { East ..	34,000	35,500	1,990	2,051	17·1	17·3	14·8
Mid ..	46,600	44,200	3,032	2,969	15·3	14·9	13·4
Weald ..	70,200	66,600	5,084	5,122	13·8	13·0	12·2
Total	150,800	146,300	10,106	10,142	14·9	14·4	13·1
Hants ..	7,100	7,100	556	573	12·7	12·4	11·6
Surrey ..	1,700	1,600	115	110	14·4	14·8	11·4
Sussex ..	24,200	19,800	1,586	1,462	15·2	13·5	12·8
Hereford ..	45,000	47,600	3,994	3,998	11·3	11·9	10·7
Worcester ..	22,300	25,000	1,894	1,901	11·8	13·1	10·2
Other Counties *	900	900	66	65	13·0	13·8	11·6
TOTAL ..	252,000	248,300	18,317	18,251	13·7	13·6	12·3

* Salop, Gloucester, and Berkshire.

The total acreage under hops returned in 1936 by occupiers of agricultural holdings exceeding one acre in extent was slightly larger than that of the previous year. Although some of the chief hop-producing counties showed decreases in acreage, these were more than balanced by increases of 63 acres in the Mid-Division of Kent and of 124 acres in Sussex. The total production is estimated at 252,000 cwt. or 3,700 cwt. more than in 1935, and is the same as the average for the ten years 1926-1935.

Hops grown by brewers for their own use, or sold by producers under registered contracts, do not come under the marketing provisions of the Hops Marketing Scheme. For this reason the quantity of hops consigned for sale to the Hops Marketing Board is less than the estimated total production of 252,000 cwt.

The yield per acre over the whole of the hop-growing areas is estimated to be 13·7 cwt. compared with 13·6 cwt. in 1935 and an average of 12·3 cwt. for the ten years 1926-1935. In Kent, which again returned more than half the total hop acreage, and nearly 60 per cent. of the total production, the yield per acre was estimated to be 14·9 cwt. as compared with 14·4 cwt. in 1935. In Sussex, which also showed the largest increase in acreage, the yield was estimated to be 15·2 cwt. per acre, compared with 13·5 cwt. in 1935 and a ten years' average of 12·8 cwt. Decreases in yield per acre and total

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production were, however, recorded both in Hereford and Worcester.

The weather conditions during the earlier part of the growing season were somewhat unfavourable, but the weather which prevailed at the end of August was ideal for the crop, and though many cases of downy mildew were observed, the quality is reported to be generally good. The area left unpicked was estimated to be 1,122 acres as compared with 632 acres in the previous year.

FEBRUARY ON THE FARM

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FEBRUARY opens the spring season of tilling and sowing, and the weather at this time makes itself felt for the rest of the year. Wet weather, frost or snow, not only delays the planting of early potatoes, and the drilling of grain crops, but delays the preparation of the land for the bulk of the sowing, which takes place in March and April. The importance of favourable weather this month is fully realized in arable districts, such as in the S.E. of England, where many like to have all their grain drilled by Lady Day. Last year, the weather was very unfavourable during the month. In the early-potato districts of Scotland, for example, much of the planting had to be delayed until the middle of March, and it was said to be the most backward season since 1895; this was due, not to cold, but to the prolonged wet weather. In discussing the subject, it is not often realized how, even in a small country like Britain, very different weather conditions may prevail for considerable periods in various portions of the country. A good example of this was encountered recently. Much rain and flooding were experienced in December in N. Wales; in Northumberland, on the other hand, especially towards the end of the month, farmers remarked about the phenomenon, unusual at that time of the year, of clouds of dust being seen above the country lanes.

Early Potatoes. With the price outlook distinctly favourable, growers of all kinds of potatoes face the coming season with unusual confidence. The area under potatoes in Great Britain has decreased by nearly 30,000 acres in the last three years. The greatest proportion of this decrease has fallen on the second earlies, which have been reduced by nearly 20,000 acres; the early varieties decreased by 7 per cent. From a national point of view this reduction is to be deplored, since potatoes are a very productive source of human food. In the statistics referred to above, it is interesting to observe how Arran Pilot increased from 850 acres in 1934 to nearly 4,200 last year, while Sharpe's

Express decreased by over 4,000 to 8,140 acres. Eclipse, the early sort, grown in the greatest quantity, remained steady. Growers who do not buy seed of new varieties until it has reached the ordinary level of prices are watching with interest the progress of the much heralded Doon Early.

A correspondent in an agricultural journal recently called attention to the "twin row" method for planting potatoes described to him by an American grower. Two rows of sets are planted in one baulk, with distances of 12 in. between the tubers; the space between the twin rows is 33 in. and thus, two rows take only 45 in. This method would be inconvenient where ordinary digging machines are used, and also under our slower-growing conditions and methods of hoeing, but it has the merit that each row has the advantage of ample width on one side. In some parts of Cornwall where they "ring the changes" between early potatoes and broccoli, and where the crop has to be lifted as soon as possible, the tubers may be as little as 8 in. apart in rows 2 ft. apart; the degree of earliness of an "early" influences spacing in addition to size of sets, etc.

Drilling Grain. The rise in commodity prices has arrived too late to affect this year's proportion of arable land, though the amount of wheat may, perhaps, be increased by growing rather more spring wheat at the expense of the other grain crops. It may be too late to increase the area under this crop, but there is still time to increase yields. If possible, the seed should be bought from a source where the possibility of serious infection from Loose Smut is small, and the seed should be treated against Bunt. If there is danger of attack from birds, the use of tar, or of tar-like substances when pickling, may be helpful. Trials in the Irish Free State show that tar in reasonable amounts does not affect germination; pigeons did not consume the grain so treated provided there was an alternative source of food. (February, incidentally, is the month for organized pigeon-shoots.) The manuring of wheat is too widely discussed to need much comment. One may, however, call attention to a note of warning contained in the latest Rothamsted Report, to the extent that now that rotations are not so strictly observed and farmyard manure may be less readily obtainable, the manuring should be watched closely to ensure that dressings are given sufficient for full crops. The effectiveness of potash and phosphate

depends much more on soil and season than that of nitrogen. In 1935, some very marked responses to potash were noted at Rothamsted, gains of 3·2 cwt. of wheat (grain) having been obtained for each 1 cwt. of potassic fertilizer; in that particular year, superphosphate was less effective than potash. Wheat grown in the rotation occupies the land when its fertility is at its highest, and, in the report quoted above, the question is raised as to whether nitrogenous dressings are necessary for wheat grown on land in good heart.

Beans, and to some extent barley, are drilled this month if weather permits. Spring beans, like wheat, should be put in as early as possible; aphid attacks are more serious in the late-sown crop. The advisability of sowing malting-barley early is much debated. The success of a February-sown barley from Hereford, when it won for its grower the Championship in the 1935 Brewers' Exhibition, gained many adherents to sowing this month; the grower, who drilled the seed in the third week in February, stated that he would have sown much earlier but for fear of starlings.

Weeds. It is difficult to eradicate charlock by the harrows when it has had several weeks to consolidate its position in the autumn-sown crops. Sharp-tooth harrows do much good when the charlock is in the rough-leaved stage, but it is not very effective later. It is then best dealt with by spraying. In chalk soils, such as are found in Wiltshire, this weed is very aggressive, and may even smother other weeds. It may be stated that wheat crops are difficult to judge this month, and many a crop that has just escaped being ploughed up has surprised the grower after the full effects of tillering have become visible.

The use, at this time of the year, of the disc cultivator on dock-infested land is sometimes said to cause trouble in the corn crops later on, this implement being blamed for cutting up the roots into several parts, each capable of becoming a live unit. On a farm managed by an acquaintance, a man had been employed for seven weeks pulling up docks in a 20-acre field of spring oats, following a ley that had been broken up with the disc; over 200 bags of small roots had been collected, and the field was still declared to be far from free. In discussing this point with a colleague, the farmer mentioned that he once saw a field that was practically a "pure culture of catmint"; the disc had been blamed for

cutting up this weed into small pieces, each of which had survived.

Lucerne. Lucerne requires much winter cultivation, which should be brought to an end by the middle of this month because of the earliness at which it starts to grow. Experienced growers say that satisfactory plants can be maintained for seven years if adequate winter cultivation is practised. It is said that it is difficult to be too drastic, and that it is best to set about it as if one were attempting to destroy the crop. Horse hoes, cultivators, pitch-pole harrows, and even the plough, are resorted to. Weeds constitute the main enemy of this crop; these are destroyed in this manner, while the lucerne is scarcely affected. A grower near Leicester, whose land is evidently ideal for this crop, claims that lucerne should last much longer than seven years with efficient winter treatment, and that the best crop he ever had was from a plant in its thirteenth year. The acreage under this crop in England and Wales increased by 2,100 acres to 38,100 acres last year. Over a quarter of the country's acreage is grown in Essex, in some parts of which county the rainfall averages only 20 in.

Cattle. The supplies of fat cattle fall off considerably this month, due probably to a decrease in demand after the Christmas season. The Report of the Reorganization Commission for Fat Stock (1934) states that the total supplies of all meat, home produced and imported, in this month are distinctly lower than those in January or March; the fact that imported supplies are not increased to level-up this drop suggests a slack demand at this time. With home-fed and home-killed beef, the fall continues, reaching its lowest point in June, when it begins a steady ascent. The complaints heard this year about the difficulty of maintaining milk supplies are not paralleled with fattening cattle; hay forms a greater proportion of the ration of dairy cows than of fattening beasts, and a wet harvest is reflected more in the supplies of milk than of beef.

There is some speculation as to the numbers of warbles that will appear this year—an index of the efficacy of the compulsory measures introduced last year. Owing to the lateness of the season last year, swellings are not likely to appear before the end of this month; after an early and dry

FEBRUARY ON THE FARM

summer, these lumps on the backs may appear as early as the middle of January.

Many milk producers at this time of the year suffer from complaints by customers about the colour of the milk. The cow can store vitamin A, or its parent substance, carotene, which gives to milk its rich colour; at this time of the year, the supplies stored by animals begin to get exhausted, and milch cows give milk of a poor colour unless green food or some type of silage or dried grass is fed. In recent research, carried out by Meeson in the U.S.A. and by S. J. Watson in Britain, the interesting fact is revealed that though the milk of some breeds has a deeper colour than that of others, the vitamin A potency need be no greater. With cows of the Guernsey and Ayrshire breeds, for example, receiving equal amounts of carotene, the former would give milk of a much deeper colour and with more carotene; the Ayrshire milk, however, while being less deeply coloured and having less carotene, would contain more vitamin A than the milk of Guernseys. Breeds differ in their capacity for converting the carotene in their diet into vitamin A. It may be mentioned that goat's milk, which is white in colour, is as potent in vitamin A as that of cows getting the same carotene-rich winter diet.

Another difficulty, a deficiency in solids-not-fat, is sometimes encountered by milk producers at this time of the year; it is not so usual as low fat content, but is more difficult to correct. In an instance investigated by the Midland Agricultural College, a gradual fall in the non-fatty solids occurred from February to March, followed by a rise from May to June; after another down-and-up movement, the proportion of these constituents settled to a steady level from November to February. Lynn, writing in *The Farmer and Stockbreeder* (August 31, 1936) states that these deficiencies, occurring towards the end of winter, improve as spring approaches. Experimental work indicates that rations cannot influence milk in this respect, but the fact that the difficulty often disappears when the cows are put on grass shows that feeding is not unconnected with the matter.

Sheep. Ewes and lambs are, this month, one of the most popular subjects for photographs in the agricultural and in the daily Press. At the time of writing, a wet, late autumn and early winter is said to have done no good to ewe flocks

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although good supplies of grass may have helped to make up for this; such weather has not been general, and flockowners in the north-west of England assert that the conditions have been so favourable that hand feeding was, in many flocks, unnecessary until the end of the year. Even allowing for the reputation of "never grumbling," possessed by the farmer in those parts, the flocks can be said to have, so far, wintered unusually well.

February is an anxious month where the bulk of the flock lambs at this time. In-lamb-ewe-disease, or pregnancy toxaemia, is at its worst in the first three weeks of this month. The disease may take various forms, and is known by different names; in the most common form the ewes are affected before lambing, and appear "silly"; the disease is, for this reason, sometimes mistaken for gid. In north Yorkshire, however, the disease affects the ewes about three weeks after lambing. The disease takes heavy toll if, as in 1936, the ewes approach the lambing season reduced in condition after having been in good condition the previous autumn. The affected ewes are generally those bearing twins, and, if the ewe survives, the lambs are dead. Though the affected ewes do not appear to be fat, they will be found, on being opened, to contain an excessive amount of fat around the bowels. The only effective preventive is to take the flock for a brisk walk of at least a mile each day as soon as the presence of the disease is suspected; this remedy was practised at least a generation ago. Walking the flock around the field is ineffective; the sheep must be taken a direct walk, such as along the road, where the affected and sluggish ewes will not get a chance of taking an inside position.

NOTES ON MANURING

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Manuring Barley. Manures can usually do little to improve the quality of malting barley, and any attempt to progress from the production of feeding barley to malting barley merely by the adoption of some particular scheme of manuring, is usually doomed to failure. The skill and care necessary in all the operations concerned with the production of a good malting sample are reminiscent of the art of cultivation as practised in years gone by, when the excellence of a seedbed was considered of more importance than its cost.

Nevertheless, as most farmers who have tackled the job will agree, the manuring of barley grown for malting purposes must be very carefully considered. As already indicated, on land in reasonably good "heart," artificial fertilizers can do little to *improve* the quality of the barley grain. In what direction then can manuring be expected to exert any important influence on the barley crop? The answer to this question is (1) that the supply of available plant food is an important factor in determining yield, and (2) that, though manuring can do little to improve quality, haphazard manuring may easily ruin the sample from the maltsters' standpoint. In general, therefore, manurial treatment should aim at producing the maximum crop that can be grown without lowering the standard of quality imposed by natural conditions such as soil and climate.

After correcting any serious lime deficiency—a necessary preliminary to the production of a good crop of barley of any description—there remain for consideration three important elements of plant food, and of these phosphorus and potassium, provided they are supplied in reasonable amounts to other crops in the rotation, are not likely to prove very serious factors except under conditions to be mentioned later. This fact was clearly established by the ten years' trials carried out by the Institute of Brewing and Rothamsted Experimental Station.¹ Nitrogen, however, usually represents the key to the manuring of malting barley. Unfortunately,

¹ *Journal of the Institute of Brewing*, Vol. XXXIX, No. 7.

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it is a key that is difficult to manipulate, owing to the many uncontrollable agencies that cause fluctuations in the supply of nitrogen present in the soil in a form in which it can be utilized by the growing plant.

Not only soil type, but previous cropping and manuring will also obviously affect the quantity of available nitrogen in the soil. Yet barley may follow roots folded on the land, roots carted off, a pulse crop or another cereal crop. The amount of nitrogen left for the barley crop will also vary in each of these instances, in accordance with the treatment of the individual crop, e.g., the roots may or may not have received a dressing of dung, and they may have been folded early or late in the season. Despite the obvious difficulties of assessing the nitrogen status of the soil, however, the importance of careful consideration of this point cannot be disregarded. That nitrogen, whether arising from organic residues in the soil or applied as manure or fertilizer, affects the nitrogen content of the grain, is illustrated by the following table taken from the Report of the ten-year trials referred to above:—

TABLE 1

Sulphate of ammonia per acre	None	1 cwt.	2 cwt.	3 cwt.	4 cwt.
Nitrogen per cent. in grain	1·37	1·34	1·50	1·56	1·71
Yield of grain per acre (bush.)	27·2	37·8	36·4	41·4	46·0

In general, samples of barley with a nitrogen content exceeding about 1·5 per cent. are not regarded as suitable for malting purposes. Although there is not always a close correspondence between the nitrogen content and the valuation of samples representing different varieties grown under widely different soil and climatic conditions, it is rare for a sample with much more than 1·5 per cent. of nitrogen to be valued at a good malting price. That very close correspondence may sometimes exist between valuation and nitrogen content for a single variety, is illustrated by the following table relating to Norfolk-grown samples of Spratt Archer sent to the Rothamsted Barley Conference held in the autumn of 1935.²

TABLE 2

Grade	I	II	III	IV	V	VI	VII
Per cent. nitrogen in dry grain	1·28	1·33	1·41	1·42	1·45	1·53	1·53

² *Rothamsted Annual Report*, 1935, p. 31.

NOTES ON MANURING

Table 1 also shows that, under the conditions of that experiment, the application of only 1 cwt. per acre of sulphate of ammonia produced a negligible effect on the nitrogen content of the barley grain, and it was only when heavier dressings were used that a serious increase in nitrogen content was brought about. Other experiments have confirmed this fact, and it seems reasonable to believe that, whilst even small dressings of nitrogenous fertilizer may be harmful to quality on a soil already rich in reserves of nitrogen, e.g., after roots heavily sheeped, most barley land in a normal state of fertility may receive up to, but not more than, 1 cwt. per acre of sulphate of ammonia without fear of seriously increasing the nitrogen content of the grain.

There is, however, one further point to bear in mind in connexion with the application of nitrogenous fertilizer, and that is the question of lodging. On fields where conditions are such that no objection can be raised on other grounds to a dressing of 1 cwt. per acre of nitrogenous fertilizer, the final decision must rest on whether that amount is likely to cause lodging. If there is no danger of this, there is little doubt that, in the majority of instances, such a dressing will be profitable, for in the ten years' experiments¹ it gave, on the average, an additional 5-6 bushels of grain per acre.

Experiments on the relative merits of different types of nitrogenous fertilizer have disclosed nothing to suggest that any one of the common types is superior to the others, provided that one compares quantities that supply the same amount of nitrogen. Hence the choice can be made for each farm solely on the grounds of price and convenience.

Unless adequate amounts of phosphate have been used for the preceding crop, it is always wise to include up to 3 cwt. per acre of superphosphate for the barley crop. Such a dressing has paid for itself on many occasions, particularly in Norfolk, and the classical long-term experiments on Hoosfield at Rothamsted also show an increase in yield from the use of phosphate. Though the soil on Hoosfield is admittedly at a low level of fertility, it is nevertheless interesting to note that phosphate and potash, used together, counteracted to some extent the harmful effect of nitrogenous fertilizer. On the average of a period of years nitrogenous fertilizer, used alone, raised the nitrogen content of the grain by 0.2 per cent., but the addition of phosphate and potash reduced this by 0.12 per cent.

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The position with regard to potash is slightly different, for it has rarely proved profitable except on light soils, where it is usually worth including. The issue, however, is further complicated by the fact that potash may, in some circumstances, bring about an altogether undesirable luxuriance in the development of undersown clovers—undesirable at any rate from the standpoint of the barley. Here again, then, caution is necessary.

When barley is grown as a second white straw crop there is little doubt that a complete fertilizer mixture including nitrogen, phosphate and potash is desirable. A suitable application on many farms would be superphosphate 3 cwt. per acre, sulphate of ammonia 1 cwt. per acre and muriate of potash $\frac{1}{2}$ to 1 cwt. per acre according to the soil type.

As regards the spring treatment of *autumn-sown* barley, this crop can usually be relied on to give a profitable response to a spring top-dressing of 1 to 1 $\frac{1}{2}$ cwt. of sulphate of ammonia if it received no autumn application of nitrogenous manure, the heavier application being suitable when the crop follows another cereal. Such a top-dressing will not usually injure the quality of autumn-sown barley.

Green Peas. As with almost all market garden crops, very few reliable manuring experiments have been carried out on green peas. Experiments are now in progress on several vegetable crops in various parts of the country, but some time must elapse before there is even as much information available as there is for many of the common agricultural crops. Experimental results relating to vegetable crops are, therefore, very welcome, and though they must be examined with caution when their numbers are so few, they will often serve as a useful guide both to growers and experimenters. The Rothamsted Report for 1935 gives a brief account of experiments on the manuring of a number of vegetable crops; these experiments have been carried out as opportunity occurred, since the year 1931. Many of the trials were on brussels sprouts, and in some instances the chief aim of the experiment was to test the merits of dried poultry manure. During the period 1933 to 1935, however, 5 experiments were carried out on peas for picking green.

Most growers nowadays will admit that phosphate and potash are important for this crop, and, unless the land has recently received liberal treatment with these two plant foods,

NOTES ON MANURING

it is a wise precaution to apply 3 to 5 cwt. per acre of super-phosphate or high-soluble basic slag, and the equivalent of about 2 cwt. of sulphate of potash.

The question of nitrogen, however, has proved much more controversial—some growers hold that the root nodules of leguminous crops make applications of nitrogenous fertilizer unnecessary, whilst others state that they have obtained appreciable benefit from dressings such as 1 to 2 cwt. per acre of nitro-chalk—sometimes applied to the seedbed and at others as a top-dressing even as late as when the crop is just coming into flower, where such a practice is possible.

Of the five Rothamsted experiments on peas, two gave significant responses to sulphate of ammonia at approximately $1\frac{1}{2}$ cwt. per acre, whilst in the others nitrogen appeared to reduce the yield. Though these results seem at first sight to be somewhat contradictory, it is worth noting that the largest reductions in yield were obtained at centres where the mean yield was relatively high. It is probable, therefore, that, on land in really good heart, e.g., where peas follow a heavily-dunged crop, additional nitrogenous fertilizer is unnecessary. On soil in poorer condition, however, it seems likely that a dressing of from 1-2 cwt. per acre of a nitrogenous fertilizer will prove beneficial, though when using nitrogen care must be taken to avoid the production of too rank growth.

Winter Grazing and Early Bite. The production of winter grazing is important to many stock keepers who have stock to winter outdoors. Both Woodman at Cambridge, and Thomas at Armstrong College, however, have drawn attention to the extremely small quantity of herbage actually *grown* during the winter months, i.e., from October onwards. This is rather contrary to the older view that, by suitable manuring early in October, good grazing could be obtained in January. Though such a practice might be successful in the south, Woodman suggests that in East Anglia the end of July is the latest time at which summer grazing must be discontinued if an adequate amount of herbage is to be produced for grazing during the winter months, and this date would also probably not be too early in the north. Given a well-balanced sward, the amount of winter grazing is more dependent on the date when summer grazing is discontinued than on manuring policy.

It is generally possible, however, to encourage early growth

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of herbage in the spring by the use of appropriate fertilizers, provided weather conditions are favourable. An application of 1 to $1\frac{1}{2}$ cwt. per acre of a quick-acting nitrogenous fertilizer in late February or early March, according to the locality, will usually encourage growth sufficiently for grazing to commence about a fortnight earlier than would otherwise be possible. For this purpose one should choose a sheltered field that has not been grazed since early autumn. The same field should not be used every year, however, or the balance of species in the sward will be upset, and the herbage plants that do *not* contribute very largely to the early bite will be favoured at the expense of those that do, and in consequence the amount and earliness of the "early bite" will decrease year by year.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Jan. 13				
	Bristol	Hull	L'pool	London	Cost per Unit ¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia :—					
Neutral (N. 20·6%) ..	7 2d	7 2d	7 2d	7 2d	6 11
Calcium Cyanamide (N. 20·6%) ..	7 1e	7 1e	7 1e	7 1e	6 10
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Basic Slag (P.A. 15½%) ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%) ..	2 6c	1 16c	1 16c	2 3c	3 1
Grd. Rock Phosphate (P.A. 20-27½%) ..	2 10a	2 5a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 3f	3 0g	3 9
" " (S.P.A. 13½%) ..	2 18	2 17	2 19f	2 16g	4 1
Bone Meal (N. 3½%, P.A. 20½%) ..	..	6 10	6 10h	6 15	..
Steamed Bone Flour (N. ¾%, P.A. 27½-29½%) ..	..	5 10	5 0h	5 0	..

Abbreviations : N.=Nitrogen ; P.A.=Phosphoric Acid ;
S.P.A.=Soluble Phosphoric Acid ; Pot.=Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London, f.o.r. depots in London district. Fineness 80% through standard sieve.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra ; for lots of 2 tons and under 4 tons, 5s. per ton extra ; and for lots of 1 ton and under 2 tons, 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons, the price is 5s. per ton extra ; for lots of 1 ton and under 2 tons, 10s. per ton extra ; for lots of 10 cwt. and under 1 ton, 15s. extra ; and for lots of less than 10 cwt. but not less than 2 cwt. 20s., extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22·4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

NOTES ON FEEDING

CHARLES CROWTHER, M.A., PH.D.,
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Restricted Rationing of Pigs. The introduction of the principle of variable payments according to quality and weight classification under the Pigs Marketing Scheme has led to the development of widespread interest in the problem of how best to use the pig's food supply to combine the production of Grade A quality with optimum financial returns.

Before the last year or two, experimental work on pig feeding was largely devoted to comparisons of the effects of different rations upon growth-rates, with little reference to the quality of the product beyond a rough grading by inspection into good, medium, and poor-quality carcasses. Since all carcasses were commonly paid for at the same rate there was clearly little practical incentive to pursue the problem of quality any further.

Feeding "standards" applicable to such conditions have been arrived at from this past experimental work, these indicating in terms of starch equivalent, protein, and minerals the needs of the average pig at various stages of growth and fattening if it is to do its best in terms of rate of live-weight increase. The amounts of food specified in these "standards" approximate to the amounts that the slop-fed pig will clean up when fed two or three times daily.

Grading experience under the Scheme has created a growing opinion that this level of supply, whilst giving the desired rapid increase of live-weight, tends in too many instances to produce excessive fat on the back of the pig, and consequent inferior grading quality. It does not necessarily follow that the financial return to the feeder will be any the worse, but clearly the point as to whether, by some reduction in the feeding scale, the desirable higher quality may be obtained without financial sacrifice, or possibly even with financial advantage, needs to be investigated.

The problem is by no means simple, since many other variable factors enter into it, such as the breed and strain of the pig used, housing conditions, and general efficiency of management. The results of an individual test can thus

NOTES ON FEEDING

only be accepted as valid for the particular combination of circumstances in which it was carried out. General guidance for the industry as a whole can only be arrived at when data are available from a sufficiently large number of such individual records to give a fair sample of the varying conditions in the industry. This limitation must always be kept in mind in applying the conclusions arrived at under the controlled conditions of experimental work to the variable conditions of practice.

That the rate at which food is supplied may have a marked effect both upon economy of production and carcass quality, when the conditions are carefully controlled by feeding each pig individually, has been clearly demonstrated in American experiments, and also in the more recent experiments of Mansfield at Cambridge. In the latter, restriction of food-supply commenced as each pig reached 65 lb. live-weight, the degree of restriction amounting at first (65-100 lb. l.w.) to one-quarter and later to one-third of the amounts consumed by similar pigs that were given as much of the same food as they would clear up at two daily feeds of half-an-hour each. Despite this considerable restriction of food-supply, and the consequent prolongation of their fattening period by an average of $27\frac{1}{4}$ days, the "restricted pigs" showed a substantial advantage in economic returns, which was associated with a marked improvement in carcass grading quality.

Further work along these lines is now desirable in order to ascertain the optimum point in the development of the pig at which restriction should commence, and the degree of restriction from that point onwards that will produce the best results.

Further, before the results of work carried out by methods of individual feeding can be applied to practice it is necessary that their applicability to group-feeding methods should be tested. In practice, pigs are always fed in groups, and any restriction of the amount of food placed in the common trough, below that which enables each pig to get his fill at feeding time, must mean almost inevitably that the stronger and more voracious pigs will be "full-fed" all the time, whilst their weaker sty-mates will go short in varying degrees. The practical problem is thus to ascertain how best to regulate the quantity of food so as to ensure optimum results in quality and financial return from the pen as a whole.

Practical experience under the grading schemes is steadily

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leading to the general acceptance of the view that, for good back-fat grading, some restriction of food supply is desirable, at any rate in the last few weeks of the feeding period, and there is a tendency to fix a maximum for the daily supply of meal at 5-6 lb.

The few experiments on which reports are now available also in the main confirm this conclusion as applied to restriction over longer periods. The experiments at Wye recently reported in this JOURNAL (this Vol., p. 235) may be quoted in this connexion. In these experiments the restriction started when the pigs were approximately 100 lb. live-weight and receiving $4\frac{1}{2}$ lb. of meal per head daily, after which the "restricted pigs" received about one-sixth less food than the corresponding pigs in the unrestricted lots. In the section composed of Large White \times Large Black pigs the effects of the restriction were definitely favourable both in back-fat grading and financial returns, but, in the other section, composed of Large White \times Essex Saddlebacks, the improvement in quality effected was much less marked and of doubtful economy in view of the fact that the restricted pigs required about 14 days longer to reach 200 lb. live-weight.

In Scottish feeding trials with Large White pigs the superiority of ordinary rationing, up to a maximum of 6 lb. daily, over *ad lib.* feeding, has once more been demonstrated, both as regards economy and quality of product, but a reduction of 25 per cent. in the rate of increase of the food supply below that commonly used proved definitely uneconomic.

At Reading similar tests have been made with Large White and Large White \times Middle White pigs. In the first test, in which the "control lot" was rationed in accordance with Wood's standards, whilst the other lot received 10 per cent. less, there did not appear to be any advantage from the restriction. In the second test, in which both lots were fed according to Wood's standards until the daily consumption reached $4\frac{1}{2}$ lb. per head, after which the daily ration of the "experimental lot" was kept at this level, the results were definitely adverse to restriction.

Whilst there appears to be good evidence, therefore, as to the desirability of some restriction of food supply at some stage of the feeding period, we are still much in the dark as to when and to what extent restriction should be introduced. A preliminary exploration of these two points has been made in a series of comparisons carried out at the Harper Adams

NOTES ON FEEDING

Pig-Feeding Experimental Station during last year. A summary of the results of these comparisons may serve to point the moral of the complexity of the problem and the danger of hasty generalizations from small-scale tests.

For the purpose of these comparisons 90 Large White pigs, all sired by the same boar, were used, these being divided into 18 pens of five pigs each, thus providing nine comparable pairs of pens. Eight of these pairs were used for duplicate comparisons of four "treatments," and the ninth for a single comparison of a fifth treatment. In each pair the pigs were drawn from as few litters as possible, and, in other ways, allotted with great care to secure comparability. During the test, trouble with pneumonia compelled the removal of a number of pigs from the experimental pens, eventually leaving a total of eighty available.

The general scheme of the test is shown below:—

<i>Pens</i>	<i>No. of Pigs</i>		<i>Feeding Treatment</i>			
{ A 1, A 2	..	5, 5	..	" Full fed " (at 2 meals daily).		
{ B 1, B 2	..	5, 5	..	Restricted 20% after 65 lb. liveweight.		
{ C 1, C 2	..	5, 5	..	" Full fed."		
{ D 1, D 2	..	5, 4	..	Restricted 20%	.. 85 lb.	..
{ E 1, E 2	..	4, 4	..	" Full fed."		
{ F 1, F 2	..	4, 3	..	Restricted 15%	.. 85 lb.	..
{ G 1, G 2	..	4, 4	..	" Full fed."		
{ H 1, H 2	..	5, 4	..	Restricted 10%	.. 85 lb.	..
{ I	..	5	..	" Full fed."		
{ J	..	4	..	Restricted 20%	.. 100 lb.	..

The maximum amount of meal given daily per head in the "full-fed" lots varied from 6 lb. to 8 lb., but in most instances did not exceed 6½ lb. Full details of the records of each pen will be given in the final report on these tests when issued, but for our present purpose the appended summary (Table, p. 1103) of the data for the combined pairs of pens will suffice:—

The pigs were marketed in three consignments, the first being despatched after 20 weeks' feeding, the second after 23 weeks, and the third after 25 weeks. The average weight at the time of consignment was 208 lb., but the weights of individual pigs varied from 190 lb. to 244 lb. The carcasses thus fell into two weight-classes for grading and payment, but to avoid complications no discrimination has been made in the data shown in the table. The belly gradings are not shown, since with very few exceptions these were all returned

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Treatment Group	I		II		III		IV		V	
	A 1, A 2	B 1, B 2	C 1, C 2	D 1, D 2	E 1, E 2	F 1, F 2	G 1, G 2	H 1, H 2	I	J
Pens ..	10	10	10	9	8	7	8	9	5	4
No. of Pigs ..	F.	R.(65 lb. 20%)	F.	R.(85 lb. 20%)	F.	R.(85 lb. 15%)	F.	R.(85 lb. 10%)	F.	R.(100 lb. 20%)
Feeding Scheme* ..	..	..	..	..	..	..	..	..	..	..
Av. Initial L.Wt., lb.	49.6	50.1	46.2	45.7	43.3	44.1	42.4	43.7	30.9	34.0
Av. days fed ..	146.7	153.7	151.6	150.7	149.5	147.0	149.5	153.0	168.4	170.5
Av. daily L.W.G., lb.	1.12	0.99	1.07	1.06	1.14	1.10	1.12	1.07	1.07	0.98
Av. meal eaten, lb.	625	538	659	548	602	540	644	590	726	621
Av. meal per lb. L.W.I., lb.	3.81	3.52	4.05	3.42	3.55	3.34	3.86	3.61	4.04	3.72
Av. carcass % ..	74.0	74.0	74.5	73.3	75.0	72.9	73.6	74.0	73.1	73.7
Back Grading % A	10	80	40	44	37½	29	12½	44	—	67
" " B	50	10	30	22	12½	57	37½	22	80	—
" " C	40	10	20	22	37½	14	37½	33	20	33
" " D	—	—	10	11	12½	—	12½	—	—	—
Av. gross ret. per pig	£ s. d. 4 16 10	£ s. d. 4 15 8	£ s. d. 4 16 3	£ s. d. 4 13 11	£ s. d. 4 17 0	£ s. d. 4 11 2	£ s. d. 4 13 7	£ s. d. 4 14 0	£ s. d. 4 16 3	£ s. d. 4 12 1
Av. cost of meal per pig	1 17 8	1 12 6	1 19 9	1 13 0	1 16 4	1 12 7	1 18 10	1 15 7	2 3 10	1 17 5
Av. surplus return over meal cost per pig	2 19 2	3 3 2	2 16 6	3 0 11	3 0 8	2 18 7	2 14 9	2 18 5	2 12 5	2 14 8
Av. margin in favour (+) of restriction	—	+ 4 0	—	+ 4 5	— 2 1	—	—	+ 3 8	—	+ 2 3

* F = Full-fed. R = Restricted.

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as "A" grade, thus confirming experience elsewhere that the major difficulty is that of avoiding excessive thickness of back-fat.

A detailed examination of the results cannot be undertaken here, and no great stress can be placed upon the quantitative differences recorded, in view of the small numbers of pigs in each comparison (notably Lots I and J); but a brief comment may be made on a few features of general interest.

Duration of Feeding. It is rather surprising to find that on the average the restricted lots required practically no longer to reach baconer weights than the full-fed lots. The latter as a whole (41 pigs) required an average of 151.6 days and the former (39 pigs) 153.4 days, a difference of only two days. This is supported by the fact that the first consignment of 33 pigs sent to the factory after 20 weeks' feeding contained nearly as many pigs (14) from the restricted lots as from the full-fed lots.

Food Consumption. From the foregoing it follows inevitably that in every instance the average food consumption for the whole period was appreciably less for the restricted lots than for the full-fed lots, the differences per pig ranging from 54 lb. (Treatment IV) to 111 lb. (Treatment II). The efficiency of utilization of the food, as measured by lb. of meal required to produce 1 lb. of live-weight increase is also seen to be invariably superior in the restricted groups.

Grading. For convenience of comparison, in view of the varying numbers of pigs per lot, the grading returns have been given in the table as percentages. The comparison of full-fed and restricted pairs of lots under the different treatments shows considerable irregularities, with on balance an advantage in favour of restriction, especially if the A and B percentages are combined. The most striking difference is under Treatment I (20 per cent. at 65 lb.), but the data under Treatments II, III, and IV, show little sign of any regular correspondence between the degree of restriction and the grading results. Taken as a whole the restricted and full-fed pigs show the following back-fat grading percentages.

	A	B	C	D
	%	%	%	%
Full fed (41 pigs) ..	22	39	31	8
	61			
Restricted (38 pigs) ..	58	21	18	3
	79			

NOTES ON FEEDING

Gross Surplus. Four out of the five treatments show a gross surplus of returns over food costs in favour of restriction, the one exception being Treatment III (15 per cent. restriction after 85 lb.). Of the two pairs under this treatment, one pair (E_2 , F_2) showed a small surplus in favour of restriction, and the other (E_1 , F_1) a rather larger deficit. The apparently anomalous result under this treatment is thus clearly traceable to individual variations within the groups. The other treatments show surpluses ranging from 2s. 3d. (Treatment V) to 4s. 5d. (Treatment II) per pig. Out of the nine pairs of pens of five pigs each used for the comparisons, the restricted pen showed a surplus over the full-fed pen in seven instances. Since there was practically no difference in expenses other than food, it is clear that in this particular test a small extra profit was obtained by restriction, amounting roughly to an average of 2s. 6d. per pig. As pointed out above, however, this result can only be accepted as valid for the particular combination of circumstances in which it was carried out.

On the detailed variations of treatment included in the test the results give no reliable guidance, and it is safe to conclude that, owing to the great variations between individual pigs under group-feeding conditions, the differences of treatment in question cannot be measured with any degree of certainty by work on the scale here used. Clearer guidance may be expected from a repetition on a larger scale of part of the test that is now in progress, but the problem is too complicated to permit of satisfactory solution by work at any one centre. It is essentially one for co-operative investigation on a common plan by institutions and others who have the necessary facilities. Only in this way can we obtain records sufficient in number and variety to give a fair sample of the conditions under which pigs are being fed in practice.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British.. ..	9 17	0 8	9 9	72	2 7	1.38	9.6
Barley, British, feeding	8 0	0 8	7 12	71	2 2	1.16	6.2
" Argentine ..	8 12½	0 8	8 4	71	2 4	1.25	6.2
" Danubian ..	8 15	0 8	8 7	71	2 4	1.25	6.2
" Persian ..	8 10*	0 8	8 2	71	2 3	1.20	6.2
Oats, English, white ..	8 10	0 9	8 1	60	2 8	1.43	7.6
" " black & grey	8 3	0 9	7 14	60	2 7	1.38	7.6
" Scotch, white ..	9 13	0 9	9 4	60	3 1	1.65	7.6
" Canadian, No. 2							
Western ..	10 7*	0 9	9 18	60	3 4	1.79	7.6
" Canadian,							
mixed feed ..	7 12	0 9	7 3	60	2 5	1.29	7.6
Maize, Argentine ..	6 5	0 7	5 18	78	1 6	0.80	7.6
" Danubian Gal. Fox	6 10†	0 7	6 3	78	1 7	0.85	7.6
" South African, No.							
2 white flat ..	7 0†	0 7	6 13	78	1 9	0.94	7.6
Beans, English, winter	6 15½	0 16	5 19	66	1 10	0.98	19.7
Peas, English, blue ..	11 5½	0 14	10 11	69	3 1	1.65	18.1
" Japanese ..	22 10†	0 14	21 16	69	6 4	3.39	18.1
Dari	8 5†	0 8	7 17	74	2 1	1.12	7.2
Milling offals :—							
Bran, British ..	7 17	0 15	7 2	43	3 4	1.79	9.9
" broad ..	8 10	0 15	7 15	43	3 7	1.92	10
Weatings† ..	8 5	0 14	7 11	56	2 8	1.43	10.7
" Superfine† ..	8 15	0 12	8 3	69	2 4	1.25	12.1
Pollards, imported ..	7 10	0 14	6 16	50	2 9	1.47	11
Meal, barley ..	9 17	0 8	9 9	71	2 8	1.43	6.2
" " grade II ..	9 2	0 8	8 14	71	2 5	1.29	6.2
" maize ..	7 0	0 7	6 13	78	1 8	0.89	7.6
" " germ ..	7 2	0 11	6 11	84	1 7	0.85	10.3
" locust bean ..	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean ..	8 10	0 16	7 14	66	2 4	1.25	19.7
" fish (white) ..	14 15	2 1	12 14	59	4 4	2.32	53
Maize, cooked, flaked ..	7 7	0 7	7 0	84	1 8	0.89	9.2
" gluten feed ..	7 5	0 12	6 13	76	1 9	0.94	19.2
Linseed cake—							
English, 12% oil ..	10 2	1 0	9 2	74	2 6	1.34	24.6
" 9% " ..	9 10	1 0	8 10	74	2 4	1.25	24.6
" 8% " ..	9 5	1 0	8 5	74	2 3	1.20	24.6
Cottonseed cake,							
English, Egyptian							
seed, 4½% oil ..	6 0	0 17	5 3	42	2 5	1.29	17.3
Cottonseed cake,							
Egyptian 4½% oil ..	5 17	0 17	5 0	42	2 5	1.29	17.3
Cottonseed cake,							
decorticated, 7% oil..	9 0†	1 7	7 13	68	2 3	1.20	34.7
Cottonseed meal,							
decorticated, 7% oil..	9 0†	1 7	7 13	70	2 2	1.16	36.8
Coconut cake, 6% oil ..	7 10	0 17	6 13	77	1 9	0.94	16.4

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Ground nut cake, decorticated, 6-7% oil	9 15†	1 7	8 8	73	2 4	1·25	41·3
Ground nut cake, imported decorticated, 6-7% oil ..	8 12	1 7	7 5	73	2 0	1·07	41·3
Palm-kernel cake, 4½-5½% oil ..	7 10†	0 12	6 18	73	1 11	1·03	16·9
Palm-kernel cake meal, 4½% oil ..	7 7†	0 12	6 15	73	1 10	0·98	16·9
Palm-kernel meal, 1-2% oil. ..	6 17	0 12	6 5	71	1 9	0·94	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale	6 5	0 11	5 14	48	2 4	1·25	12·5
Brewers' grains, dried porter ..	5 17	0 11	5 6	48	2 2	1·16	12·5

* At Bristol. § At Hull. † At Liverpool.

‡ In these instances, manurial value, starch equivalent and protein equivalent are provisional.

NOTE: The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the end of December, 1936, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £11 per ton, then, since its manurial value is £1 per ton as shown above, the cost of food value per ton is £10. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 8d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·43d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations, a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N., 7s.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	8 12
Maize	78	7·6	6 5
Decorticated ground-nut cake ..	73	41·3	9 3
„ cotton-seed cake ..	68	34·7	9 0

(Add 10s. per ton, in each instance, for carriage.)

The cost per unit starch equivalent works out at 2·01 shillings, and per unit protein equivalent 1·32 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9·6	7 17
Oats	60	7·6	6 11
Barley	71	6·2	7 11
Potatoes	18	0·8	1 17
Swedes	7	0·7	0 15
Mangolds	7	0·4	0 15
Beans	66	19·7	7 19
Good meadow hay ..	37	4·6	4 0
Good oat straw ..	20	0·9	2 1
Good clover hay ..	38	7·0	4 6
Vetch and oat silage ..	13	1·6	1 8
Barley straw ..	23	0·7	2 7
Wheat straw ..	13	0·1	1 6
Bean straw ..	23	1·7	2 8

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

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The Agricultural Index Number

THE general index number of the prices of agricultural produce for December is 126 (base 1911-13=100) compared with 125 for the previous month and 114 for December, 1935. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index is 130.) During the month under review, all classes of fat stock and poultry showed a seasonal rise in price, but in the case of fat cattle and sheep this was relatively less than in the base years. Quotations for wheat, oats, butter, potatoes and wool also were higher, but those for barley, eggs, cheese and hay declined.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1931	1932	1933	1934	1935	1936
January	130	122	107	114	117	119
February	126	117	106	112	115	118
March	123	113	102	108	112	116
April	123	117	105	111	119	123
May	122	115	102	112	111	115
June	123	111	100	110	111	116
July	121	106	101	114	114	117
August	121	105	105	119	113	119
September	120	104	107	119	120	127
October	113	100	107	114	113	125
November	112	101	109	114	113	125
December	117	103	110	113	114	126

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936
January	—	111	119	124	125
February	—	110	117	122	123
March	—	106	112	118	122
April	—	109	116	126	128
May	—	105	116	117	120
June	—	104	114	117	121
July	—	104	117	120	121
August	108	108	122	120	124
September	108	111	125	128	133
October	104	112	121	119	129
November	105	113	120	119	129
December	107	114	120	120	130

(a) Commenced August, 1932. (b) Commenced September, 1934.

Grain. At an average of 8s. 8d. per cwt., wheat advanced by 1d.; the rise, however, of 4 points in the index to 118 was

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due more to a fall of 2*d.* per cwt. in the base price. Quotations for barley fell by 3*d.* to 9*s.* 6*d.* per cwt., but, as a similar reduction was recorded during the corresponding months of 1911-13, the index at 115 remains unchanged. Oats averaged 7*s.* 1*d.* per cwt. against 6*s.* 10*d.* a month earlier and the index shows an increase of .3 points to 101. In December, 1935, wheat averaged 5*s.* 8*d.* per cwt., barley 8*s.* 3*d.*, and oats 5*s.* 10*d.*, and the relative indices were 77, 100, and 83.

Live Stock. Fat cattle prices were higher on the month, the average of second quality at 32*s.* 7*d.* per live cwt. being 1*s.* 4*d.* more than in November. This rise, however, is not so pronounced as that which occurred during the base years, and in consequence the index declines from 93 to 91. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, raises the index to 105. At an average of 10½*d.* per lb. for second quality, prices of fat sheep rose by ½*d.*, but, at 128, the index is lower by 2 points owing to the increase in the base period being proportionately greater. Quotations for baconers advanced from 11*s.* 10*d.* to 12*s.* 5*d.* per score (20 lb.) and those for porkers from 13*s.* 9*d.* to 14*s.* 3*d.*, the relative indices rising from 118 to 124 and 126 to 131.

Compared with November, both dairy cows and store cattle were dearer. The index for the former at 111 is higher by 2 points and that for the latter at 98 by 3 points. Store sheep and pigs made slightly more money; the respective indices are 113 and 156.

Dairy and Poultry Produce. There was no alteration in the regional contract price of milk during December and the index continues at 171. Butter sold at an average of 1*s.* 2½*d.* per lb. against 1*s.* 2*d.* in November, the index rising by 1 point to 98. At 17*s.* 11*d.* per 120, quotations for eggs were reduced by 1*s.* 8*d.*, and, in consequence, the index falls by 5 points to 106. Cheese was slightly lower in price; a firmer tendency in the base prices accentuates the fall in the index which is of 4 points to 103. All classes of poultry sold at higher prices and the combined index rises from 116 to 119.

Other Commodities. At £7 17*s.* 6*d.* per ton, the average price of potatoes showed a rise of 9*s.*, the index at 220 comparing with 209 a month earlier. Both descriptions of hay sold at rather less money, and the combined index at 98 shows a decline of 4 points. Wool rose in price by 1½*d.* to 1*s.* 3½*d.*

MISCELLANEOUS NOTES

per lb. and an advance in the index from 107 to 118 is recorded.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1934		1935		1936		
	Dec.		Dec.	Sept.	Oct.	Nov.	Dec.
Wheat	66		77	98	113	114	118
Barley	104		100	124	119	115	115
Oats	95		83	98	99	98	101
Fat cattle	90		91	98	95	93	91
„ sheep	119		119	131	131	130	128
Bacon pigs	107		98	111	114	118	124
Pork „	124		110	109	119	126	131
Eggs	97		110	124	141	111	106
Poultry	110		120	113	115	116	119
Milk	171		171	202	171	171	171
Butter	82		93	98	98	97	98
Cheese	93		87	106	101	107	103
Potatoes	133		185	149	202	209	220
Hay	104		84	105	102	102	98
Wool	84		91	100	102	107	118
Dairy cows	103		104	103	107	109	111
Store cattle	82		92	97	95	95	98
„ sheep	99		106	132	132	117	113
„ pigs	148		131	138	150	155	156

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	118	124*	130	131	130	133
Fat cattle	103	105	113	109	108	105
General Index	120	120*	133	129	129	130

* Superseding figure previously published.

Investigations into the Brood Diseases of Bees

SOME three years ago, as reported in the January, 1935, issue of this JOURNAL, an investigation into the cause and treatment of so-called "Foul Brood" diseases of bees was initiated at the Rothamsted Experimental Station, Harpenden, under the direction of Dr. H. L. A. Tarr. Results have been reported from time to time in technical and scientific journals, and were summarized at the Conference on Bee Diseases held at Rothamsted in September last. Dr. Tarr has shown that European and American Foul Brood are two distinct diseases with different causal organisms. The latter is due to *Bacillus larvae*, its incidence being independent of the strength of the colony, while the former is usually a disease of weak stocks,

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probably caused by *Bacillus pluton* in association with other organisms. He has drawn attention to a third condition known as "Addled Brood," forming approximately one-third of the cases received for examination. This is due to a defective condition of the queen, and can be cured by re-queening. The Research Committee and the British Bee-keepers' Association are of opinion that the investigations should be continued. It is estimated that the annual cost will be £550, towards which the Agricultural Research Council has sanctioned an increased grant of £300 for the current year on condition that a further sum of not less than £250 is contributed from other sources. An appeal has been circulated to societies and individuals having an interest in this matter to send donations, or an annual contribution for the three years, to the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

Foot-and-Mouth Disease.—An outbreak of Foot-and-Mouth Disease was confirmed at Donnington, Ledbury, Hereford, on January 16. The usual Infected Area restrictions were imposed over an area of approximately 15 miles round the infected premises. The area under restrictions lies within the counties of Gloucester, Hereford and Worcester.

No further outbreak occurred in the Staffordshire and Warwickshire Infected Area, and the area was, therefore, released from restrictions on January 18.

A further outbreak was confirmed at Flagg in the Derbyshire Infected Area, on January 9, but nevertheless, the Area was contracted on January 13 to one extending to approximately five miles round the infected premises at Flagg.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at King's Buildings, Smith Square, London, S.W.1, on Tuesday, January 12, 1937, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered a notification from the Kesteven and Lindsey (Lincolnshire) Agricultural Wages Committee of its decision to fix minimum and overtime rates of wages to come into force on January 31, 1937 (i.e. the day following that on which the existing rates expired), and to continue in operation until January 29, 1938. The minimum rates for male workers of 21 years of age and over are: (1) waggoners, 39s. (as at present) per week of 52½ hours in the weeks in which Good Friday, Coronation Day and Christmas Day fall, 50 hours in the week in which August Bank Holiday falls, 58 hours in any other week in the period from May 14 to October 14, and 61 hours in any other week during the remainder of the year; (2) shepherds, 37s. (as at present) per week of 45½ hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 55 hours in any other week in summer, 47½ hours in the week in which Christmas Day falls and 56 hours in any other week in winter, with additional payments for the lambing season; (3) stockmen, 38s. (as at present) per week of 46½ hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 56 hours in any other week in summer, 49½ hours in the week in which Christmas Day falls and 58 hours in any other week in winter; and (4) other male workers,

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32s. (as at present) per week of 41 hours in the weeks in which Good Friday, Coronation Day and August Bank Holiday fall, 50 hours in any other week in summer (instead of 42 hours and 51 hours respectively as at present) and 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter; with overtime in the case of all classes of male workers at 10d. per hour on weekdays and 1s. per hour on Sundays (instead of 9d. and 11d. respectively as at present). Provision is made for an adjustment of the hours in respect of which the minimum weekly wage is payable in the weeks in which Easter Monday and Boxing Day fall, to meet cases where holidays are given in those weeks instead of in the weeks in which Good Friday and Christmas Day fall. For female workers of 17 years of age and over the minimum rate is unchanged at 5½d. per hour for all time worked.

Enforcement of Minimum Rates of Wages.—During the month ending January 13, 1937, legal proceedings were taken against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Northants ..	Daventry ..	5 0 0	0 2 6	28 13 9	1
Notts ..	Retford ..	5 0 0	0 5 0	44 0 0	1
Yorks, W.R. ..	" ..	5 0 0	0 2 6	33 18 7	1
	Knaresboro' ..	2 0 0	—	17 10 3	1
Caernarvon ..	Bettws-y-coed ..	1 0 0	0 13 6	3 9 6	1
Denbigh ..	Llanrwst ..	0 10 0	0 5 0	5 0 0	1
		18 10 0	1 8 6	132 12 1	6

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Hampshire: Mr. C. P. Quarrell, B.Sc., has been appointed Assistant Horticultural Adviser.

Lancashire: Miss M. M. Haley, N.D.D., has been appointed Assistant Instructor in Dairying, *vice* Miss G. V. Moore, N.D.D.

Norfolk: Mr. W. J. West, B.A., Dip. Agric., has been appointed Agricultural Advisory Officer, and will take up his duties on February 1, 1937.

Shropshire: Mr. A. McVicar, B.Sc. (Agric.), N.D.A., N.D.D., has been appointed Chief Agricultural Officer, and will take up his duties on April 1, 1937, on the retirement of Mr. E. Druce, M.R.A.C.

Wiltshire: Mr. J. J. S. Webster, N.D.A., M.R.A.C., has been appointed Temporary Assistant Instructor in Dairying, *vice* Mr. J. A. Wyatt, B.Sc. (Agric.), N.D.A., N.D.D.

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Feeds and Feeding: A Handbook for the Student and Stockman.

By F. B. Morrison. 20th edition. Pp. vi + 1050. Illus. (Ithaca, New York: The Morrison Publishing Co., 1936. Price \$5.00).

This American textbook needs no introduction to students of animal husbandry in this country. For many years, in earlier editions, it has occupied a place of honour on their bookshelves in company with that German classic, Kellner's treatise on the feeding of domestic animals.

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The first edition was written by Prof. W. A. Henry, one of the foremost agricultural authorities of his times. It was published in 1898 and gained immediate favour among agriculturists in the United States. From that year until 1935 no fewer than nineteen editions were issued, several printings being made of each of the later editions. It was entirely rewritten in 1910 by Prof. Henry with the help of the present author, Prof. Morrison, who, in the succeeding years assumed the sole responsibility for the revisions necessitated by new editions of the work. The senior author died in November, 1932, at the age of 82 years.

Appealing as it does to scientific man and practical stockman alike, the treatise has grown steadily in popularity with the years and is now familiar to students of animal husbandry in almost every country. It has been translated into Russian and Portuguese. Its gradual evolution through successive editions has contributed to its solidity and comprehensiveness, but its original "readableness" has not been sacrificed. It is, in short, the almost perfect textbook.

In the preparation of this entirely rewritten edition, Prof. Morrison explains that he has spent much time during the past few years in compiling and analysing the results of experiments on live-stock feeding conducted in all parts of the world. The results of these studies are incorporated in the new edition, which thereby becomes as up to date as it is possible for any textbook to be in this age of intensive research and discovery.

The printing, illustrating, and binding of the book are in every way worthy of the treatment of the subject. That it is intended primarily for American agriculturists should by no means deter the British reader from including this excellent treatise in his collection of works dealing with the problems of live-stock feeding.

English Farming, Past and Present. By Lord Ernle. 5th edition. Edited by Sir A. D. Hall (Longmans, Green & Co. 15s. net.)

Lord Ernle's masterpiece requires no introduction. The book was first published in 1888 (under the title of *The Pioneers and Progress of English Farming*); it was first issued under its present title in 1912, since when it has passed through four editions and two new impressions, and has become a familiar source of reference to almost a generation of agriculturists. In this fifth edition, edited by Sir Daniel Hall, about fifty pages have been revised or added, and the story has been brought up to date.

Apart from a short addition to the chapter on tithe, revision of the text first occurs with the period following the great depression of the 70's and 80's of last century, and the course of the gradual recovery from then up to the Great War has been rewritten. The part played then and subsequently by research and education is expanded in a separate section, while further new chapters are entitled Agricultural Legislation since the War, Small Holdings, and Technical Progress since the War. The appendices have also been modernized by bringing the statistics of crop acreages and live-stock numbers up to date, and by including the index numbers of prices since 1918.

Sir Daniel is to be congratulated on the way in which he has performed his task—no light one in view of the high standard set by Lord Ernle. He has, indeed, contributed a very valuable and readable addition to what must always remain a classic work on English agriculture. His task has been all the more difficult in that he is dealing with conditions and movements so recent that their ultimate importance can scarcely yet be assessed. One is rather disposed to question some of his points dealing with technical progress since the War. For example, after describing the introduction and spread of tractors, he continues (p. 452)

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that "A greater revolution in the application of power to the farm came later, as the capacities of the 'combine' machines used in America and Australia for harvesting cereals, became known in this country." This statement seems to be laying undue emphasis on the combine, for a quite negligible proportion of British farms were equipped with these machines even in 1936. Then again, one may ask what evidence there is for the statement (p. 471) that in recent years "throughout the agricultural industry a tendency towards specialization may be noticed; the old mixed farming is being exchanged for businesses chiefly concerned with one or two kinds of production." Sir Daniel's interpretation is strangely in contrast with Lord Ernle's dictum (4th edition, p. 383) that "variety is one of the enforced improvements in modern farming." Considering the marked increase in the potential number of products now open to farmers in comparison with, say, fifty years ago (e.g., poultry, milk, sugar-beet, potatoes, vegetables, fruit, flowers), the evidence surely tends to support Lord Ernle. It is true, of course, that modern machinery and methods have greatly increased the size of the "economic unit" in production, but this is quite another matter from "specialization" in the sense in which Sir Daniel uses the word.

Except for these, and a few minor criticisms, this new edition deserves unstinted praise. No man is better qualified than Sir Daniel Hall to describe the development of and part played by education and research in recent years, and his account of agricultural legislation since the War, though necessarily cursory, is clear and helpful. The volume is produced in the quality of printing and paper to which we have become accustomed in previous editions.

The Earth Goddess: A Study of Nature Farming on the West African Coast. By G. Howard Jones, M.A. Pp. vii + 205 and 8 Figs. (Published for the Royal Empire Society. London: Longmans, Green & Co., 1936. Price 12s. 6d.)

Though this book begins with a chapter of ethnology and a brief account of West Coast religions, it is really a discussion of African native agriculture. The point the author makes is that primitive agriculture is entirely bound up with social organization, and therefore with tribal custom, which finds its sanctions in religion. When the white man intrudes and essays to improve the simple and apparently wasteful systems of farming that he finds prevailing, not only may he make technical mistakes because he has not a sufficient experience of the conditions of the problem, but he may find himself cutting across some of the most deeply-rooted instincts of the tribe. For example, in South and East Africa the whole question of the preservation of the land in its present state of fertility, even of the very land itself, depends upon effecting a reduction in the numbers of live-stock kept by the Bantu tribes. In many instances the cattle are neither milked nor eaten, only the hides and skins being turned to economic purpose, and yet they are multiplied as tokens of wealth and status.

Again, the handing over of cattle is part of the ceremony of marriage, whereby the woman is accepted into the family—the most intimate bond in tribal organization. With the cessation of war and raiding, cattle, sheep, and goats have increased until they have bared the grazing grounds of vegetation and exposed the soil to such intense erosion as to make deserts of great tracts that formerly carried stock and game.

Mr. Howard Jones is concerned with the impact of the white man and his methods of farming upon the native communities. He recognizes the splendid work done by the officers of the agricultural departments in the native reserves, but he wants a consideration of the general policy that should be adopted. He has little interest in the white settlements

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and other plantation types of farming, and does not incline to the idea that they contribute much to the education of the natives in better practices. Although they have introduced to the African cash crops for sale, these new cultivations often impair tribal customs of land tenure and deflect the cultivator from the all-important food crops. He recognizes that in some way or other individual ownership, or, at least, individual security of tenure, must replace the tribal ownership and shifting cultivation prevailing over so much of Africa, but perhaps he attaches too much importance to possession. He quotes Arthur Young's dictum: "Give a man the secure possession of a bleak rock and he will turn it into a garden: give him a nine years' lease of a garden and he will convert it into a desert." Where will men look with their own eyes and see how often possession confirms a man in a sterile tradition? However, Mr. Howard Jones is a confirmed "smallholder" advocate, with its usual sequence of agricultural co-operation and Folk High Schools. His book is interesting and suggestive, but it does make one wonder whether he is being true to his earlier text—that one cannot transplant European systems wholesale with Africa.

Growing Pastures in the South. By Joseph F. Combs, B.S. Pp. ix +270, and 78 Figs. (Chapel Hill: University of North Carolina Press, 1936. Price 9s.)

This is in the nature of a handbook on pasture management, more particularly for those concerned with the Southern States of the United States of America.

To the British reader the chief impression left on the mind is the enormous scope that exists for pasture improvement in the United States, and the immense amount of investigation that still awaits to be undertaken. The author deals with his subject in a straightforward manner, and, as far as he goes, presents a considerable amount of well-arranged and accurate information.

In discussing manuring, he lays chief emphasis on the value of phosphates, and stresses the necessity of ascertaining the phosphate requirement of the soil. His references to lime are scanty and somewhat incidental, and this is most noteworthy in a comprehensive chapter on the inoculation of legumes, in which no allusion is made to the essential part played by calcium in connexion with the proper development of the nodule organism; in a subsequent chapter, however, he rather casually notes that lime is necessary for the proper growth of red clover.

Six chapters are devoted to a description of the more important grasses and of their uses, and five to leguminous plants. The important question of strain and variety is, however, to all intents and purposes completely ignored. Thus, in the discussion on red clover no distinction is made between the early- and late-flowering varieties, although it is pointed out that the strains of red clover that have been developed in the United States are superior to imported European strains for use in that country. White clover is dealt with under two headings only, "White Dutch" and "Ladino." The strains of white clover met with in the blue grass pastures are, however, very different in the aggregate from "White Dutch" as properly understood, and from the point of view of American pastures it cannot be doubted that there is scope for an immense amount of breeding work with white clover collected from such pastures.

The seeds mixtures prescribed in the closing chapter have the appearance of being sensible, and all of them are at least simple, but in practically every instance they have been drawn up in sole relation to soil type, and without regard to the all-important question of subtle differences in management. Where hay as such is mentioned (e.g., West Virginia),

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nothing is said as to the date when fields are closed in relation to seeds mixture.

The index is complete in so far as the various species of plants are concerned, but slight in other directions; thus, calcium, though referred to at least once in the text, finds no place in the index.

This is hardly a book in which the British student of grass land will find information of a sort likely to be of great value to him, either in the realm of facts or of ideas.

Rich Land, Poor Land: A Study of Waste in the Natural Resources of America. By Stuart Chase. Pp. x + 361, 11 Figs. and 9 maps. (London: McGraw-Hill Publishing Company, Ltd., 1936. Price 10s. 6d.)

The problem of the wastage and destruction of soils has occupied the attention of soil investigators for more than a generation. During recent years it has been brought to the notice of a wider public and has become, in certain countries, the subject of action by the State. In no country has the menace of soil wastage been more acutely felt than in the United States. Losses by water erosion have been going on since the earliest white settlements; but so long as there was an apparently inexhaustible area of land for new colonization these losses were accepted with complacency. Early in the present century, settlement was practically completed, and the limited extent of the agricultural resources of the country was realized. The spectacular losses by wind erosion during recent abnormal droughts have served to focus public attention on a problem that has long been known to exist.

Mr. Chase's book is a remarkable exposition of the problem of wastage, and more particularly the wastage of soil by destructive erosion. Although written for a lay public, it is based on trustworthy data, which are handled with conspicuous ability. The evils proceeding from the unintelligent exploitation of the soil are clearly traced, and the urgent necessity for national action is emphasized. Since it is known that about 30 per cent. of all the farm lands of the United States are either destroyed, damaged, or menaced by erosion, the gravity of the situation cannot be too forcibly represented to the American people. The institution of the Soil Conservation Service in 1935 shows that the Government is aware of the problem.

Mr. Chase is not wholly alarmist. He expounds clearly the principles of soil reclamation and conservation, and illustrates them by an account of the work of the famous Tennessee Valley Authority, set up as part of Mr. Roosevelt's "New Deal." From this account it would appear that the regeneration of this valley, a region of 40,000 square miles stricken by soil erosion, drought, and flood, could only be accomplished on the plea of improving navigation in the Tennessee River and its tributaries. Navigation, however, implies flood control; flood control implies dams and reservoirs; reservoirs must be protected from silting up, and hence erosion must be checked; erosion control implies agricultural reconstruction and planned utilization of the land. And thus, starting with the innocent object of improving river navigation, an organization has been developed which touches the whole economic and social life of the valley.

"Rich Land, Poor Land" has its lessons for the British Empire. There are great areas in Africa and elsewhere in which soil destruction is proceeding rapidly and irrevocably. This remarkable and fascinating book should be read by all who have sufficient interest in public affairs to realize the importance of land as a national resource. It might well be ranked as a companion volume to Stapledon's "The Land, Now and To-morrow," reviewed in this JOURNAL for January, 1936.

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Profit from Fertilizers. By Six Authors. Preface by Viscount Bledisloe. Pp. 176 and 20 Figs. (London: Crosby, Lockwood & Son, Ltd., 1936. Price 7s. 6d.)

This book, which contains sections by H. V. Garner, H. C. Long, A. H. Hoare, R. G. Stapledon, F. Rayns and T. Wallace, shows how the best use can be made of the gradually diminishing supplies of farmyard and other organic manures by an adequate appreciation of the value of inorganic fertilizers. Many farmers, though admitting that artificial fertilizers will increase the yields of their crops, are often in doubt as to whether the value of the increase will cover the cost of the fertilizer treatment. The object of *Profit from Fertilizers* is to tackle the subject from this standpoint of "profitableness."

The elements of plant nutrition and the properties and composition of farmyard manure, organic manures, artificial fertilizers and lime are briefly discussed. Chapter III, entitled "Compound and Concentrated Fertilizers," deals chiefly with the so-called concentrated complete fertilizers. These are admittedly a recent addition to the list of fertilizers and an account of their composition and properties is welcome. The reader is tempted to ask, however, whether the principles underlying their use are so very different that the manufacturers' recommendations for individual crops must necessarily precede the chapters, written by the chief contributors to the book, on the manuring of the various crops.

A concise but critical account of the principles of grassland manuring, by Professor R. G. Stapledon, is followed by a chapter devoted to the improvement of hill pastures by the same writer. This section is both interesting and stimulating, and serves to illustrate some of the present-day methods of attacking grassland problems as well as providing much valuable information.

Mr. Rayns then deals with the manuring of arable crops, and gives a general review entitled "Manuring the Rotation." This review presents the whole problem of the manuring of arable crops in a form that will be appreciated by the practical farmer, and, like the rest of this section, gives considerable prominence to the financial aspect of the use of fertilizers.

In the section on the Manuring of Fruit Trees, by Dr. T. Wallace, the reader is warned at the outset of the complexities of the problem, but the account is so arranged that he finds himself led to a clear understanding of the difficulties involved. It is obvious that there is much sound experimental evidence underlying the recommendations in this section. Attention is also given to the results of recent research work on the effects of manuring on quality and storage troubles.

In the section on Market Garden and Flower Crops, by A. H. Hoare, it is stated that "very little carefully organized field experimental work has been carried out on vegetable crops in England." Hence, the information on many of the 34 vegetable crops considered, is in the nature of general recommendations. The author of this section advocates the practice of considering fertilizer requirements in terms of fertilizer ratios, but, for some reason, does not adopt the method in the case of all vegetable crops, and, when dealing with flowers, adopts the method for one crop only.

There are very few errors in the text; no doubt the discrepancy between the heading and footnote in Appendix III and the reference on p. 77 to the illustration facing p. 80, will be corrected in due course.

The book is attractively produced and will afford useful guidance to practical farmers, especially those seeking to take advantage of the large amount of experimental work on fertilizers, carried out in recent years. It will also serve to introduce the student to many of the practical problems associated with the use of fertilizers.

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Hardy Fruit Growing. By Sir Frederick Keeble and A. N. Rawes.
Pp. xi + 334, and 21 Figs. (London: Macmillan & Co., Ltd., 1936.
Price 16s.)

The names of the joint authors will lead readers to expect a reliable summary of the present state of knowledge and experience in regard to fruit-growing out of doors in this country and they will not be disappointed. The many aspects of this not too simple subject are presented in an easily assimilable form, and, when recommendations are made, the reasons that are thought to underlie them are given in simple language. The information provided should enable beginners to obtain a fair grasp of the subject, and will remind experienced fruit-growers of points they have overlooked.

The book is divided into three sections, the first of which deals with the general principles and practice of fruit-growing. Information is given as to the suitability of different soils and situations, preparation of the ground and protection of fruit trees against wind and vermin. Then follows an account of the kind of trees and bushes to buy, the methods of cultivation, manuring and pruning. The defence of trees against attack by insect pests and disease, renovation of old trees, and finally the picking and storing of all fruits. In covering such a large range of subjects, many of which have never been fully explored by science, it would be surprising if there were not two opinions about some of them.

The remarks on soils are particularly good, but, though reference is made to the need for more soil surveys, no mention is made of the various official bulletins, which cover the surveys that have already been completed. A valuable and still much needed warning against overcrowding is given, but some of the distances given in the table seem quite inadequate. It is strange to find that half-standard apples are only to be allowed a quarter the area allotted to standards, although, if the varieties and stocks are the same, the trees might be expected to attain the same spread. The spaces allowed for bush and cordon apple trees are also rather small, except under very poor growing conditions. Although information is given on planting, the arrangement of the trees and methods of marking out, points that cause a lot of trouble in practice, are not mentioned. It appears to be assumed that all good fruit must be grown on cultivated land. The view that apple trees (not necessarily standards) are more easily controlled and produce fruit of better quality on grass land, is not even mentioned. The chapter on manuring is of great value, but the recommendation of chemical analysis of the soil, as a means of ascertaining what manures are required, is surprising, in view of its general failure in practice. The best time for the application of nitrogenous artificial manures to fruit trees has not been determined. Many fruit-growers obtain better results by applications on cultivated ground made earlier than the dates mentioned and very much earlier on grass.

The chapter on pruning is excellent, though its relative importance seems to be somewhat exaggerated. No mention is made of other ways (e.g., manuring) in which similar and sometimes better results can be obtained. Good management, as the first line of defence against pests and disease, is wisely stressed, but good spraying, the second and final line of defence, is very inadequately treated.

Section II contains information on the varieties of fruit to plant, and is intended to be used as a work of reference. Particularly useful are the dates of flowering, information on cross-pollination and varieties, though some of the varieties listed as "commercial" would not be planted as such to-day. Brief notes on the pests and diseases attacking each kind of fruit are given. Growers of Bramley will be surprised to find that it is described as resistant to scab. In dealing with blackcurrants the

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warning that only disease-free material should be planted, might have been repeated, as has been done in the cases of raspberries and strawberries. The value of planting disease-free material has never been so thoroughly demonstrated, as with blackcurrants.

Section III is described as an introduction to Commercial Fruit-growing. Major Monro contributes a useful chapter on, "What Markets and Public Want," and brief references are made to planning and marketing, and to strawberries under glass. The book as a whole will be most useful to all fruit-growers, whether they grow for pleasure or profit.

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<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : Feb. 1, 8, 15, 22	6.20	Mr. J. G. Stewart	For Farmers only.
Midland : Feb. 5	8. 0	Mr. C. H. Gardiner	Our County Correspondent ; Worcestershire.
„ 11	6.40	Mr. W. B. Thompson	For Midland Farmers.
„ 15	7.30	Mr. Graham Castle	Our County Correspondent : Gloucestershire.
North : Feb. 5	7.30	Mr. W. E. Shewell-Cooper	Fruit Growing in the North.
„ 12	8.10	Messrs. W. B. Mercer and William Dutton	Pig-keepers.
„ 26	6.40	Mr. A. McVicar	Early potatoes.
Western : Feb. 4, 18	6.50		Fortnightly Letter to Western Farmers.
„ 11	6.40	Messrs. A. W. Ling and T. R. Ferris	For Western Farmers.
„ 25	6.40	Messrs. A. W. Ling and C. D. Ross	For Western Farmers.
Wales : Feb. 5	8.30	Mr. Moses Griffith, Dr. T. J. Jenkin, Mr. Trevor Thomas and Mr. Jarvis	Pasture and Grass Culture (in Welsh).
„ 19	7.30	Messrs. Moses Griffith and R. J. Gardner	Discussion on Store Cattle (in Welsh).
Scottish : Feb. 4	6.25	Dr. W. G. Ogg	Soil Research and the Farmer.
„ 11	6.30	Mr. A. D. Buchanan Smith	For Scottish Farmers.
„ 17	6.40	Messrs. A. R. Wannop, J. F. Duncan, and A. N. Other	Junior Agricultural Clubs.
Northern Ireland : Feb. 5	8.0	Mr. H. O. H. O'Neill	The Care and Handling of Milk.
„ 12	8.45	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
„ 26	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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NOTES FOR THE MONTH

Exposure of Overstocked Cows in Markets

THE Ministry desires again to call attention to the practice of exposing for sale in markets overstocked cows, that is to say, cows left unmilked in order to distend the udders and show the animals' capabilities.

In a notice issued some months ago, it was pointed out that the practice is not only quite unnecessary to convince a purchaser that the cow possesses good qualities as a milker, but that, in a very large proportion of such instances, it may involve suffering to the animal, in which event the person responsible renders himself liable to legal proceedings for cruelty under Section 1 of the Protection of Animals Act, 1911, or of the Protection of Animals (Scotland) Act, 1912, as the case may be. In the previous notice an appeal was made to farmers, market authorities, auctioneers and all others concerned, to co-operate in discouraging this very objectionable practice.

Reports since received by the Ministry from various parts of the country indicate that, while the practice of overstocking continues, there is some tendency to improvement, and that the feeling against the practice is growing, and has been stimulated by various articles in the agricultural press and elsewhere. In many quarters, the opinion has been expressed that a more rigorous application of such penalties as are permissible under the Protection of Animals Acts should be aimed at in order to put an end to this cruel practice.

The Ministry desires to take this further opportunity of emphasizing the fact that the overstocking of cows is not necessary to reveal the milking qualities of the animal and that it may not only involve severe suffering, but also have a detrimental effect on the future milking capacity of the cow.

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It makes this further appeal to all concerned to do everything in their power to discourage and put an end to the practice.

Hot-Water Treatment of Narcissus Bulbs

THE hot-water method is now the standard treatment for dealing with narcissus bulbs infested by eelworm, perhaps the worst of all narcissus pests. In addition the method is being adapted to the treatment of other plants, such as strawberries and chrysanthemums, and there are indications that its range of usefulness may be still further extended. Unfortunately, however, the treatment has not in practice given the complete measure of success that on theoretical grounds was to have been expected, and that could usually be obtained in scientific trials. The reasons for these difficulties that have been met with in the hot-water treatment of narcissus bulbs have therefore been investigated during the past few years at the Seale-Hayne Agricultural College by Messrs. Staniland and Barber, and their conclusions have been published by the Ministry in the form of a Bulletin.*

The authors state that unsatisfactory results with bulb baths may be due to a number of different causes, all or any of which may be operating in any given instance. The factor that appears to have led most frequently to the survival of eelworms in treated bulbs is the use of sacks instead of rigid containers in the baths, but other factors, such as inaccurate thermometers or incorrect steam pressures, are little less important. A warning is therefore given as to the need for caution when endeavouring to improve the performance of bulb baths. That improvement is often necessary is, however, clearly indicated, and it is hoped that the information provided in the Bulletin may result in the hot-water treatment giving even greater satisfaction than it has in the past.

Seed Potatoes

THE time will soon be here for planting seed potatoes, and in this connexion growers may get valuable help from a leaflet that the National Institute of Agricultural Botany

* Bulletin No. 105, *The Efficiency of Baths used for the Hot-water Treatment of Narcissus Bulbs*. Obtainable from H.M. Stationery Office, or through any bookseller, price 1s. net (1s. 1d. post free).

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issues free of charge direct to farmers or through the County Agricultural Organizers or Horticultural Advisory Officers.

First early varieties recommended are Arran Pilot (immune from wart disease), Epicure, Ninetyfold, Duke of York, Sharpe's Express and Eclipse. Arran Pilot has fulfilled its early promise, but since it is somewhat susceptible to virus diseases care must be taken to obtain seed from a virus-free crop.

The only true second early worth growing is the old susceptible variety, British Queen. Most of the early maincrops can, however, be lifted soon enough for this purpose, Arran Banner (immune) being particularly suitable.

The best of the maincrops in order of maturity are King Edward, Majestic (immune) and Arran Banner (immune). King Edward is the most popular variety with the consumer and consistently fetches higher prices than others. The yield is lower than those of the other two and in order to produce a bold sample many soils require liberal manuring. Arran Banner yields heavily. Its tubers are apt to be coarse and it is recommended that the sets be planted not more than 12-14 in. apart.

Gladstone is mentioned as an immune substitute for King Edward, which it resembles in yield, cooking quality and tuber characteristics.

Whatever the variety grown, it is of the first importance that healthy seed be used. It is recommended that seed from virus-free stocks should be planted at least every second year.

The Chocolate Spot Disease of Broad and Field Beans

DR. A. R. WILSON, the author of the article under the above title in last month's (February) issue of this JOURNAL, has drawn attention to an error in the caption to Fig. 3 of the illustrations (inset plate facing p. 1048), in which the word "widened" has been printed instead of the word "induced." The caption should read as follows: "Fig. 3.—(Right) Shoot of field bean, taken from a plant growing in a field plot, and showing artificially induced 'non-aggressive' and slight 'aggressive' Chocolate Spot infection. The foliage was sprayed, during wet weather, with a spore suspension of *Botrytis cinerea* in water."

Interesting Birds : (1) The Barn Owl

THIS is perhaps the most useful of all our native birds. Its food consists mainly of rodents—rats, mice, and voles being taken by it in large numbers. It also occasionally captures small birds, such as sparrows. The barn owl (see illustration) hunts almost entirely by night, when rodents are most active, and its opportunities for good work are therefore greater than those of any diurnal bird. Every farmer should make it his business to protect and encourage such an asset to the land.

Both adult and young barn owls are very voracious. One observer records that in a single night a pair of barn owls brought to their young no fewer than 27 mice and four rats. Another records an instance in which 20 freshly-killed rats were found in one nesting-hole, while a third states that a half-grown barn owl ate 9 mice in rapid succession and was hungry again in three hours. The barn owl, like other birds of prey, has the habit of disgorging indigestible matter, such as bones and fur, in the form of pellets. One of our greatest ornithologists states that in 700 pellets of this owl he observed the remains of 2,513 mice, 1 mole, and 22 birds, of which 19 were sparrows.

The barn owl is easily identified and is in fact unmistakable. It is about a foot in length. Its face and the whole of its under-parts are pure white. Its upper parts are yellowish buff, beautifully marked with brown, grey, and white. Its legs are covered with white, downy feathers, and its eyes are black.

The barn owl breeds in a variety of situations: in lofts, barns, belfries, and in holes in trees. It makes no nest. Its eggs, which may number from 4 to 7, are dull white and rather rounded in shape. This bird has the habit of laying its eggs by "instalments," so that it is possible to find, at one time and in the same nesting-hole, fresh eggs and young of different ages.

Although the barn owl's true character and great value to agriculture are now more widely known than in the past, it is a regrettable fact that even to-day specimens are shot or otherwise destroyed. The law provides heavy penalties for the killing of barn owls or the taking of their eggs and young. There is some ground for the belief that the species is declining in numbers, which is an added reason why this absurd persecution should be combated in every possible way. Any



Barn Owl, with young rat in its beak. A flashlight photograph taken at 11.30 p.m.
Photo: Eric J. Hosking.

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farmer who has a pair of barn owls on his land is to be congratulated. They will do him no harm whatever, but will, on the contrary, be working for his benefit all the year round.

The Society of Engineers

Two papers on farm engineering problems were read to the agricultural section of The Society of Engineers during the past session and are reported in full in the Journal of the Society, October-December, 1936. The titles of these papers are, "Some Aspects of Cultivation and Other Power Operations on the Farm," by Dr. B. A. Keen and G. H. Cashen, and "Agricultural Tractor Design" by D. N. McHardy.

In the first of these papers Dr. Keen comments adversely upon the degree of mechanization that has taken place in farming in this country, saying that the horse remains at least as important as steam-engines, internal-combustion engines, and electric motors, and seems likely to continue so for a long time to come. He criticises severely the results of such scientific inquiry as has yet been made into cultivation problems. He says that no definite answers have yet been obtained to the questions: (a) what is the effect, if any, of surface cultivations while the crop is growing? (b) is a perfect tilth essential for a satisfactory crop? and (c) does the farmer get nothing but the satisfaction of artistic achievement from the extra labour? He instances a comparison of deep versus shallow cultivation that has been made in America, seemed to show that deep ploughing was unnecessary, and indicated that it is at least open to question whether at Rothamsted, or elsewhere, subsoiling or indeed any form of deep cultivation will necessarily produce increased yields. He discusses rotary cultivation and compares it with the older forms. He says that rotary cultivation appears to improve germination and early growth, but that the difference does not persist. The yields of arable crops, however, are as great with rotary cultivation as with the older methods.

The paper also discusses the electric motor versus internal-combustion engines, threshing and barley grinding, and much of the discussion that followed it is well worthy of perusal.

The second paper, on Agricultural Tractor Design, dealt with the development of the internal-combustion engine and forms a valuable review of the progress made in bringing that

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machine to its present state of perfection. Mr. McHardy states that the first British oil-engine tractor for agriculture, although not designed as a plough tractor, appears to have been the Ruston-Hornsby that received the Royal Agricultural Society's silver medal at the Manchester Show of 1897. This machine cost £500. Since then, of course, many and various types of farm tractor have been designed and used—and a large number of them abandoned. The author of the paper includes a discussion of the main types that have been produced and of the types that have survived. The discussion that followed the paper was participated in by, among others, Dr. Denham, Colonel Johnson, and Mr. Neale, and it is not too much to say that, although the paper does not venture very far into the realm of prophecy, users of tractors throughout the country will find it full of useful information.

Back Issues of this Journal

THERE may be many readers of this JOURNAL who retain their copies for binding, but whose sets are not complete. The Ministry desire to make it known that although many old issues of the JOURNAL are out of print, at least a few copies of most issues of recent years are still available and can be obtained by readers who wish to fill gaps in their volumes. Of the forty-three volumes completed with this issue, very few numbers of the first ten volumes can now be supplied. If readers will send a note of their requirements to The Controller, His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, they will be informed whether the copies can be supplied. The cost in every instance will be the face value of the relative issue.

Copies of most of the twenty supplements that have been issued with the JOURNAL from time to time are also available, and a list of these may be obtained on application.

Varieties of Cereals and Lucerne for Spring Sowing

A FARMER buying a new car can gain considerable assistance in his choice by studying the results of genuine reliability trials of different makes "drawn from stock." He may not always realize, however, that he can obtain similar, or even greater, help in making his choice of new cereals, for field trials are carried out continuously by the National Institute of

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Agricultural Botany with the sole object of providing reliable information on the comparative merits of the many varieties. Recommendations made on the results of these trials are issued from time to time in leaflet form and can be obtained free of charge through all Agricultural Organizers or direct from the N.I.A.B. For those whose time is very precious the brief summary given below should be a guide for this season's spring sowings.

While not encouraging the growing of spring wheat, since it is seldom a profitable crop, the Institute's experience shows that if this practice is followed, the most satisfactory varieties are Little Joss if drilled by the middle of February, Red Marvel or A.1 for the first half of March, and thereafter until the middle of April, April Bearded.

With regard to oats it recommends Victory, Eagle, Star, Golden Rain, and Golden Rain II—the last two essentially for home consumption, for although very heavy yielders their grain, which is of excellent feeding value, is small and its yellow colour does not find universal favour among purchasers. Marvellous is recommended for early sowing on good soils, as is Resistance, which though primarily a winter variety also produces high yields when sown early in spring. Among the oats still under trial Onward appears very promising.

In barleys the Institute restricts its recommendations to the well-known varieties Plumage Archer and Spratt Archer. The "1935" Plumage Archer has given better results than the "1924." Where late sowing cannot be avoided Svalof Victory or the Danish Kenia and Maja deserve trial.

If lucerne is being sown the Institute advises the Hungarian strain or French Provence strain. English-grown seed of these would be expected to give as satisfactory results as imported seed, provided the germination of the seed was equally satisfactory.

Whichever variety is chosen, early sowing almost always pays. English-grown seed gives just as good results as imported seed, if the standard of purity and germination is the same. A further leaflet dealing in general terms with choice of seed, in which such points as purity, germination, variety, origin and price are dealt with, has been compiled by the Institute, and those who obtain it (gratis) either from County Organizers or direct from the Institute should find it of considerable use when deciding what seed to buy.

NOTES FOR THE MONTH

Sampling Observations on Wheat 1936-37: Report for First Quarter

THE present season is the fifth during which the full scheme of observations has been in progress. The Lord Wandsworth Agricultural College, Long Sutton, Hampshire, is not taking part in the scheme this year, but observations have been started at a centre at Carlisle, Cumberland, so that the number of stations continues to be ten, as in the three previous years. The first quarter's observations cover the period from sowing to the beginning of shoot formation, and a summary of the observations is shown in the table below, the stations being arranged in order of sowing date. All stations grow two standard varieties, Squarehead's Master and Yeoman, and a third variety is being grown at four stations.

Weather conditions during October were favourable for the sowing of winter cereals, and, at eight of the ten stations, sowing took place between October 21 and 31. The interval from sowing date to date of appearance above ground is influenced mainly by temperatures, which were above normal in the first fortnight of November. Thus, germination has been fairly rapid this winter, the mean interval from sowing date for the two standard varieties being twenty-two days, with a range from fourteen days at Cirencester to thirty-five days for Yeoman at Newport. The mean intervals and ranges for the past five seasons are compared below:—

<i>Season</i>	1932-33	1933-34	1934-35	1935-36	1936-37
Mean interval (days) ..	23	24	17	29	22
Range (days)	10-37	18-39	10-22	10-74	14-35

The outstanding seasons were 1934-35, in which germination was unusually rapid at all stations, and 1935-36, in which it was rapid at the six stations where sowing took place early, but of unprecedented length at the remaining four, owing to severe cold in December. The other three years, 1932-33, 1933-34, and the present season, may be regarded as normal as regards length of germination interval.

Yeoman has generally appeared above ground slightly earlier than Squarehead's Master, and this year it did so at eight stations. Exceptions to this rule usually occur only at stations at which germination has been delayed, as shown this year by the two exceptions, Newport and Carlisle, which had the longest germination intervals.

NOTES FOR THE MONTH

The first plant number counts are taken about three weeks after appearance above ground. Plant numbers are somewhat higher than last year at most stations. Newport has again had a poor stand. Yeoman has a higher count than Squarehead's Master at seven stations.

The local varieties have, so far, shown the same rate of progress as the two standard varieties at the four centres where they were grown, and no outstanding differences appear.

SAMPLING OBSERVATIONS ON WHEAT, 1936-37 : FIRST QUARTER

Station	Variety	Sowing date	Appearance above ground	Plant density per 32-metres drill	
			Date	First count	Date
BOGHALL, Edinburgh	S.H.M.* Yeoman	Oct. 21	Nov. 11 Nov. 10-11	1,961 2,526	Nov. 30
CIRENCESTER, Gloucestershire	S.H.M. Yeoman Little Joss	Oct. 22	Nov. 5.09 Nov. 4.75 Nov. 5.07†	1,784 2,101 1,732	Nov. 27
ROTHAMSTED, Hertfordshire	S.H.M. Yeoman Victor	Oct. 23	Nov. 9.53 Nov. 7.88 Nov. 9.00	1,533 1,907 1,660	Nov. 30
WOBURN, Bedfordshire	S.H.M. Yeoman	Oct. 26	Nov. 16.75 Nov. 16.09	1,602 2,078	Dec. 19
NEWPORT, Shropshire	S.H.M. Yeoman	Oct. 28	Nov. 30 Dec. 2	691 389	Dec. 23
WYE, Kent	S.H.M. Yeoman	Oct. 29	Nov. 14.38 Nov. 13.09	1,633 1,850	Dec. 5
PLUMPTON, Sussex	S.H.M. Yeoman	Oct. 29	Nov. 15.50 Nov. 13.47	508 546	Dec. 10
SEALE-HAYNE, Devonshire	S.H.M. Yeoman Garton's No. 60	Oct. 31	Nov. 16.03 Nov. 15.22 Nov. 16.66	2,015 2,315 1,916	Dec. 10
SPROWSTON, Norfolk	S.H.M. Yeoman	Nov. 20	Dec. 18.19† Dec. 18.00†	2,244 2,155	Jan. 8
CARLISLE, Cumberland	S.H.M. Yeoman Wilhelmina	Dec. 3	Jan. 3.72 Jan. 4.09 Jan. 4.34	1,087 1,076 1,246	Jan. 28

* Squarehead's Master.

† Based on 16 instead of 32 observations per variety.

‡ Based on 30 instead of 32 observations.

NOTES FOR THE MONTH

Revision Course in Horticulture at Reading

A REVISION course in Horticulture will be held at the University of Reading from September 14 to 17, 1937, inclusive. The papers and discussions at the Conference will deal with Commercial Flower Production. The course has been arranged primarily for members of the horticultural staffs of counties, colleges and universities, but growers and other persons interested in the industry will be welcomed. The annual meeting of the Horticultural Education Association is to take place at Reading during the same week. Accommodation will be provided for members of the Conference in the University Halls of Residence from the evening of September 13 to the morning of September 18, at a cost of 11s. per day for full board, including bed, breakfast, luncheon, tea, and dinner. The tuition fee for the course will be £2. Further particulars may be obtained on application to The Secretary, Agricultural Office, The University, Reading.

Prize Essays in Agricultural Economics

THE Agricultural Economics Society has decided to offer two annual prizes of £10 and £5 respectively for essays on subjects connected with the economics of agriculture. Competitors must be either students at recognized institutions or holders (of not more than two years' standing), of degrees and/or diplomas in agriculture and/or economics. Essays for the current year must be sent in by March 31, 1938, and must be on one of the following subjects:—

- (a) Social and economic changes in the position of farm workers during the last twenty years.
- (b) Sub-marginal land in Great Britain.
- (c) The nature and extent of changes in farm organization and technique since the War.
- (d) The influence of a more adequate and well-balanced dietary for all classes upon the character of British Agricultural Output.
- (e) Agricultural Tariffs and Quotas in Europe since 1924—Their Growth and Objects.
- (f) Britain's security in time of war depends on home-production rather than on importation of food supplies.

PARISH BY-WAYS

P. E. GRAVES,

School of Agriculture, Cambridge.

BY-WAYS are a universal heritage, dear to the heart of poet and prose writer—and a curse to the man doomed to live on the spot! Wanderers venturing down these quiet tracks during the height of a dry summer have little idea of the conditions of these unmetalled roads—or “droves” as they are locally called—during the winter months, while the trials of the occupiers of isolated land are beyond their imagination. Although many droves are passable for motor traffic during the summer time, a heavy rain soon reduces them to a quagmire, and horses are the only sure means of transport for at least half the year. Even then, however, the going is often very difficult, as two horses can draw only a small load, and the strain on carts and harness makes carriage an expensive item when deprived of the advantage of good roads. Extracts from “The Story of the King’s Highway,” by S. and B. Webb, show that in the last century the condition of most roads was equally bad, and therefore the ownership of land on a public road was not considered an advantage, being more easily a prey to thieves. Those dark ages are past, and it seems unbelievable that despite the progress of communication in all other respects, these by-ways are practically in the same derelict state as they were a hundred years ago.

An interesting illustration, which the writer gives from personal knowledge of the parish, is that of Cottenham, one of the largest villages in Cambridgeshire, situated some six miles north of Cambridge, and covering an area of 7,224 acres. The river Ouse forms the northern boundary by which it is separated from the Isle of Ely, the parish lying between Willingham and Rampton on the one side, and Landbeach, Histon, and Impington on the other. Practically 70 per cent. of the land might be described as “fen,” and most of the bad roads are naturally associated with these parts of the parish.

Apart from some 905 acres enclosed in the reign of Queen Elizabeth, the open field system of land tenure persisted until 1842, the fenland being devoted to commons, while the open fields were situated on higher ground. One of the duties

PARISH BY-WAYS

entrusted to those who carried out the work of enclosure in 1842 was to provide adequate roadways, with powers to alter or stop up any that existed previously. Little need be said of the latter, but the steps taken in this direction appear to have made the village more isolated. A public bridle-road and footpath leading to the Aldreth Causeway was done away with, and an outlet (for the land served by the private roads Nos. 17 to 19) to the public road to Rampton was also discontinued. In all, five such roads were closed, together with a large number of public footpaths.

The plan of Cottenham opposite shows the roadways laid out in 1846. The extent of what are termed "private" roads is considerable; indeed, out of a total of some $27\frac{1}{2}$ miles of roads no fewer than approximately 20 miles are designated as private. In addition to these roads there are, of course, numerous rights-of-way that have not been included on the plan. Although some of the roads are fairly near to one another, communication is often difficult owing to the presence of a network of dykes for the drainage of this area. These roads were probably laid out with the object of reducing the number of bridges to a minimum. During the course of almost a century, only two of the twenty-five private roads have become public highways—(1) part of Rooks Street (No. 20 on the map), about one-eighth of a mile in length, and now perhaps the most thickly populated part of the parish; and (2) Road No. 1, a little over 2 miles in length, leading to Twenty Pence Ferry. The former must have been taken over by the local authorities many years ago; the transference of the latter was only achieved in 1929. Although this recent development cost many thousands of pounds, it was considered that the volume of through traffic to the adjoining parishes would justify a grant from the Ministry of Transport, in consequence of which the contribution by the owners of some 740 acres of adjoining land was at the modest rate of 30s. per acre.

The Cottenham Award, 1842, provides that:—

And we the said Commissioners do hereby direct that the private Roads hereinbefore set out and appointed pursuant to the said Act shall at all times hereafter be maintained and kept in repair by and at the expense of such of the Owners or Proprietors for the time being of any of the lands within the said Parish as shall for the time being use such Private Roads in the Shares and Proportions following (that is to say) each such Private Road requiring repair shall be divided across into three equal parts and all persons using such Road to an extent not greater than one of such divisions thereof in respect of such lands shall contribute

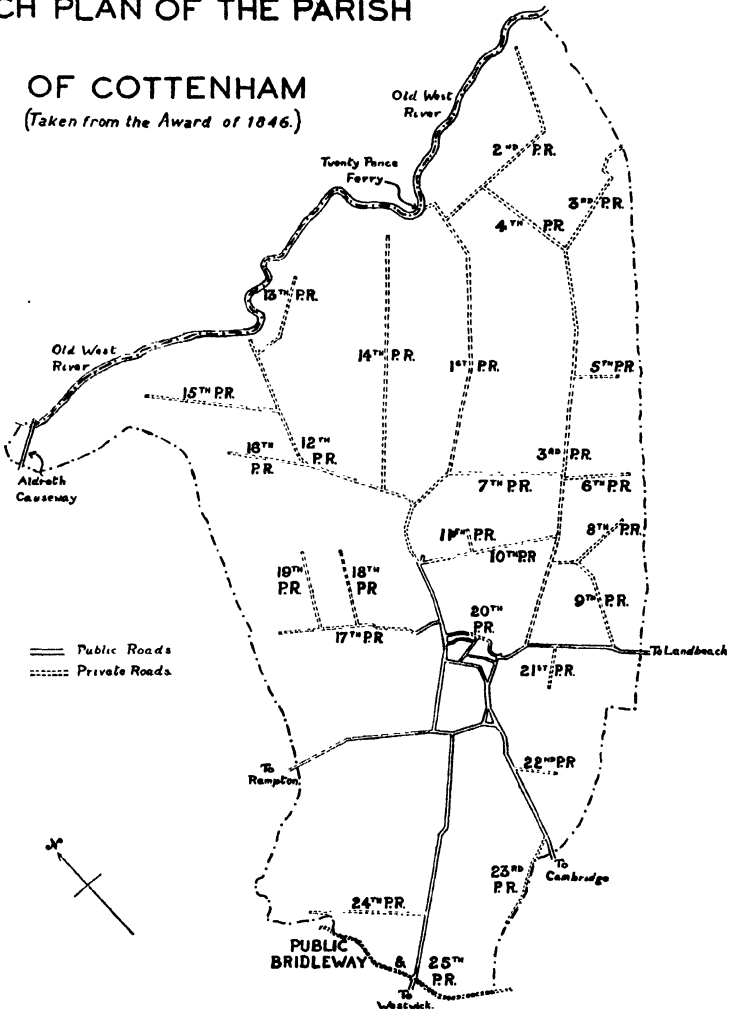
PARISH BY-WAYS

one equal sixth part of such expenses. And all the persons using such Road to an extent greater than one but not greater than two of such divisions thereof in respect of such Lands shall contribute two equal

SKETCH PLAN OF THE PARISH

OF COTTENHAM

(Taken from the Award of 1846.)



Cottenham: Byways and Highways in 1846.

sixth parts of such expenses. And all persons using such Road to a greater extent than two such divisions thereof in respect of such Lands shall contribute three equal sixth parts of such expenses. And as between the persons respectively contributing to the said expenses in any one of the three classes hereinbefore mentioned the contribution (whether one

PARISH BY-WAYS

sixth two sixths or three sixths) payable by such Class as aforesaid shall be assessed and paid by them by an equal Acre rate according to the number of Acres and so in proportion for any less quantity than an Acre in the Lands in respect of which such Roads shall be used by such Class. And that for the purpose of making such repairs in any of the said Roads any one or more person or persons using any such Road for the time being which may in his or their judgement require repair may convene a Meeting of the Parties using such Road by a Circular Letter addressed through the Post or otherwise to each of such persons specifying the time place and object of the Meeting and any two or more persons or the Majority of them if more than two of them assembled at such Meeting may resolve that such Road shall be repaired accordingly and may select one or more person or persons to superintend the repairs thereof accordingly and to assess in the manner and proportions hereinbefore mentioned the rate requisite for providing for the expenses of such repairs.

The provisions quoted show that the owners of the land concerned are entirely responsible for the state of these "droves" in that they are trustees of their holdings. The assumption that their attention or neglect is immaterial to the parish is erroneous, for it is a matter affecting the welfare of the whole community. Some of the older inhabitants of Cottenham can well remember how careful the farmers were in the past in trying to prevent deep ruts developing and water standing on the surface. A man was often employed cutting channels to the sides in order to drain away any surface water, and carters were warned of the importance of "quartering" the track so as to try and prevent the ruts getting deep. When a large hole developed a bundle of faggots would be put in to prevent the jolting of carts, this being removed in the spring when the surface was dry enough to harrow the road and scrape it level.

This careful administration was at a time when each parish was on a more or less self-supporting basis, and the necessity of good roads in order to make the best use of the land had nothing like the importance it assumes to-day. There is no doubt, however, that the reverse of this careful management has been going on for some years. It will be found that horses and carts keep to the same track until so many large holes develop that it becomes impassable, when another track will be tried to one side. It should be mentioned that some of these private roads are as much as 40 ft. wide. When the surface dries in the spring there is no liability as to who shall level these roads, and it is naturally left to the man with the most initiative, or perhaps to someone who wishes to do some carting. Many of the contrivances for the levelling of the surface would make worthy exhibits in a museum.

PARISH BY-WAYS

Usually the form consists of a heavy harrow to which is attached one half of a cart tyre, with sufficient weight on top to keep it down. When this is drawn along each rut the harrow breaks up the surface, the tyre acting as a scraper, and, being semi-circular, guides the earth into the low places. Such tools are crude, but they can be very effective for their purpose. The introduction of tractors has led to a more efficient tool based on the lines of a road grader with the object of not only smoothing the surface, but also getting a "crown" to the road and thus allowing surface drainage. This levelling of the surface is simply a matter of routine on most of the roads; it takes but little time, and where no rates are levied several of the occupiers may give the man who does the job a few shillings for his trouble.

Evidence that our public roads received similar treatment in comparatively recent years, and that the type of tractor tool now used for levelling the surface is simply a revival of an ancient implement, is given in the writings of Albert Pell* who wrote in 1887 that:

People now living may have seen decaying under the walls of the parish church the enormous wooden plough, girt and stayed with iron, which, as spring approached, was annually furbished up and brought into the village street. For this, owners or their tenants, acting in concert, made up joint teams of six or eight powerful horses, and proceeded to the restoration of their highways, by ploughing them up, casting the furrows towards the centre, and then harrowing them down to a fairly level surface for the summer traffic.

It may perhaps be interesting to examine in closer detail one section of the parish where all the land is approached by means of droves. For this purpose the northern section, known as Smithey Fen and Setchell Common served by the five roads Nos. 12 to 16, is taken as an example. The area of the land amounts to some 1,630 acres, and at the time of enclosure (1842) it was held by 72 individual owners, the largest holding being 208 acres, while some holdings were less than one acre in extent. This represents an average of some 23 acres each, but since that date changes in ownership have amalgamated some of these holdings, and the area per owner to-day is in the region of 27 acres.

On the north-east extremity one property is traversed by the Aldreth Causeway. This was the ancient entrance to the Isle of Ely by land, but its purpose to-day only serves as a

* See *Journal of the Royal Agricultural Society* (Second series, Vol. 23, part 2, 1887).

PARISH BY-WAYS

very neglected drove to occupiers of land in adjoining parishes. Apart from this, there are just under five miles of private road having only one outlet for vehicular traffic; this, be it noted, for a fertile area of land that is considerably greater than the whole of the adjoining parish of Rampton. The population is sparse, there being only eight cottages besides one attached to the pumping station. The bulk of this land only represents a part of the occupiers' total holdings; indeed, some have land scattered throughout the parish, and their concern as to road conditions is only relative to the area and type of land in their occupation. The presence of a few large landowners in the area probably accounts for the provisions of the Award having been carried out regularly for some years.

The damage done in consequence of only one year's neglect, however, cannot be made good in a hurry. In the past, the rates levied were 1s., 6d., and 3d. per acre, in accordance with the proportion of road used by the occupier. In practice this recognized system was felt to be unfair, because an occupier of a field rated at 3d. per acre might do more damage to the road by carting in wet weather than his neighbour with a self-contained holding farther on rated at 1s. per acre. In 1935 it was agreed that all should pay 1s. per acre, a progressive movement that ought to be reflected in road conditions in future. This, however, must depend on the continuity of a policy that can only be enforced so long as it complies with the law. The voluntary basis of contribution, however, coupled with the fact that all rates should now be levied on annual value and not on acreage, must constitute a serious menace. There can be no doubt that better roads in this area would lead to a greater development of the land, and react to the benefit of occupiers and to the whole district.

At present the position in Cottenham may be summarized by stating that there are some 17½ miles of private roads serving an area of approximately 4,200 acres of land. About half a mile of this compares favourably with some public roads; the remaining roads, however, are no more than dusty by-ways in summer and impassable mud tracks during winter. The land approached by 5 miles of these is now rated at 1s. per acre for the purpose of repairs and maintenance, while the remaining 12 miles are completely neglected, apart from the voluntary contributions of individual occupiers. If the example set by the former could be extended to all

PARISH BY-WAYS

the private roads of the parish, a sum of no less than £200 per annum could be expended each year.

Judging by the condition of many droves in other parishes in this district it would seem that the attention they receive is very similar to that of Cottenham. For instance, the parish of Rampton, consisting of 1,372 acres, was provided in 1852 with seven private roads of 2 miles in length, and about $2\frac{1}{2}$ miles of public road. The Award stipulates that these seven roads:

. . . shall be maintained and repaired by and at the expense of the proprietors and occupiers of Lands and Tenements in the said Parish and in such manner as the public roads within the same are by law liable to be supported and kept in repair.

Apart from the efforts of individual occupiers nothing appears to be done to the private roads in this parish.

The actual wording of Awards probably varies in each parish, but there can be little doubt as to the Commissioners' definite intentions for private roads to be kept in repair. Although the administration of the two parishes mentioned has been placed in the hands of occupiers, an isolated instance of public administration can be found in the parish of Swavesey. In this, the Award of 1840 stipulates that the various public and private roads:

. . . shall for ever hereafter be supported maintained and kept in repair by the Surveyor or Surveyors for the time being of the Highways within the said Parish of Swavesey by and at the expense of the Owners and Proprietors for the time being of the Lands and Grounds in Swavesey aforesaid by the said Act directed to be divided and allotted and the respective Tenants and Occupiers thereof in the same proportions as they contribute to the repair of the Public Roads.

These provisions have not been allowed to lapse, and every year a small committee headed by the clerk of the Parish Council decide the amount of money required, when accordingly the local authority levies a rate on approximately 3,400 acres of land. The amount collected has varied considerably between one year and another, but the influence that the consistent maintenance has exerted can easily be seen by contrasting the by-ways with those of other parishes; though probably the by-way rates would have ceased with the derating of agricultural land had it not been for the vigilance of those in authority. After careful deliberation during an interval of two years a regular system of collection is again in operation.

PARISH BY-WAYS

These cursory remarks cannot do more than ventilate a subject the importance of which is felt in many parishes throughout the country, and is undoubtedly worthy of an authoritative inquiry. Whether the acreage of derelict land is relatively high on private as compared with public roads is difficult to say, but there is no doubt that bad roads have a very detrimental effect on agriculture. It should not be forgotten that until 1929 the occupiers of remote farms paid local rates in spite of being penalized by isolation. The apathy of owners, the spasmodic efforts of a few, and the periodical discussions on these "droves" should be matters of past history. Several occupiers have expressed the opinion that all soft roads should be placed under one authority and administered in a similar fashion to those of Swavesey parish. Naturally, the provisions of many parish Awards become obsolete, and, in the course of time, complications by points of law add to the difficulties of administration. If reassessment by local authorities takes several years to determine as in the case of Swavesey, how much longer must it take for occupiers who are inexperienced in such matters. Certain it is that they should be offered some guidance. Agriculture can hardly be expected to make these droves up to the standard required*for adoption by local councils, but regular attention would make them at least serviceable.

LAYOUT FOR A MODERN BULB BATH

M. H. TRIBE, M.A.(Cantab.), F.R.H.S.

OF the bulb growers who were able to attend the conference held in December, 1935, at Seale-Hayne College to discuss the Hot-Water Treatment of Narcissus Bulbs, many went home with their faith in the efficiency of their bulb baths shattered. The very informative papers read by Mr. Staniland and Mr. Barber of Seale-Hayne College, giving the results of their research work, showed very conclusively that the majority of existing bulb baths fall very far short of the standard of accuracy necessary for this work. It is sufficient here to state that an instrument was evolved for recording with a high degree of accuracy the temperature both of the water at various points in the bath and also of the interior of selected bulbs at any moment during treatment. With this instrument most of the principal sterilizing plants were given a thorough test, and the results were plotted in a series of curves. These results were in many instances an unpleasant shock to the owners. Quite frequently the ordinary bath thermometer was steady at 110° F., while bulbs in some parts of the bath never exceeded 108°, a temperature at which it takes four times as long to kill eelworm. There can be little doubt that most of the otherwise unaccountable cases of apparent reinfection of stocks after treatment can be traced to this cause.

As considerable extensions were being made to the bulb store at the Buckland Flower Farm, the writer's property near Kingsbridge, it was decided to take the opportunity of installing a new bulb bath, laid out to give the maximum efficiency on the lines suggested by the latest research work. The plant is in itself very simple, but considerable thought has been given to the layout to secure absolutely efficient treatment and easy working, while eliminating all risk of reinfection.

An ordinary vertical cross-tube boiler is installed in a lean-to shed outside the walls of the bulb store. Steam at about 20 lb. pressure passes through a Royle reducing valve, which reduces the pressure to 5 lb., to a coil in the bottom of a large cylindrical tank, 6 ft. deep and 6½ ft. diameter. The tank

A MODERN BULB BATH

is supported on three brick piers, arranged radially, raising it so that, while most of it is in the ground floor of the bulb store, the top projects 2 ft. through the floor above, into a room reserved for sterilizing, the floor fitting tightly round the tank to prevent dust from getting through. There is also a pipe for injecting live steam into the tank for rapid heating up, the outlet being fitted tangentially in the bottom of the tank to help circulation by imparting a rotary motion to the water.

In the back wall of the sterilizing room is a hatch, through which the bulbs can be loaded straight into the tank from the store behind, where untreated bulbs are kept and loaded into containers. In the floor of the sterilizing room is another hatch, giving access to a shute down which the containers, after treatment, can be conveyed to the ground floor, which can be reserved for treated bulbs awaiting planting. This gives "one-way traffic" and reduces risk of reinfection. A 6-in. coaming is provided around the floor-hatch, to prevent dust being swept down. Boiler, pipes and tank are thickly lagged with asbestos to retain the heat, and, as regards the tank, to prevent uneven heating owing to

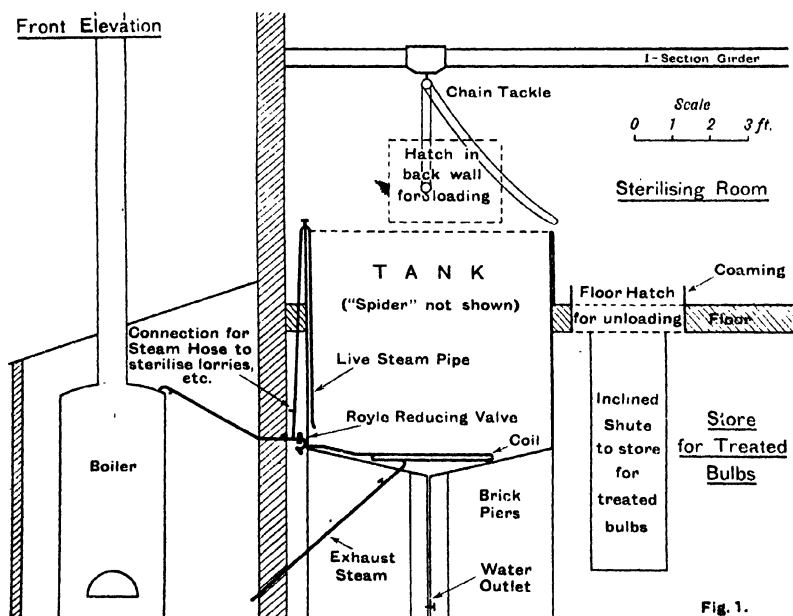


Fig. 1.

A MODERN BULB BATH

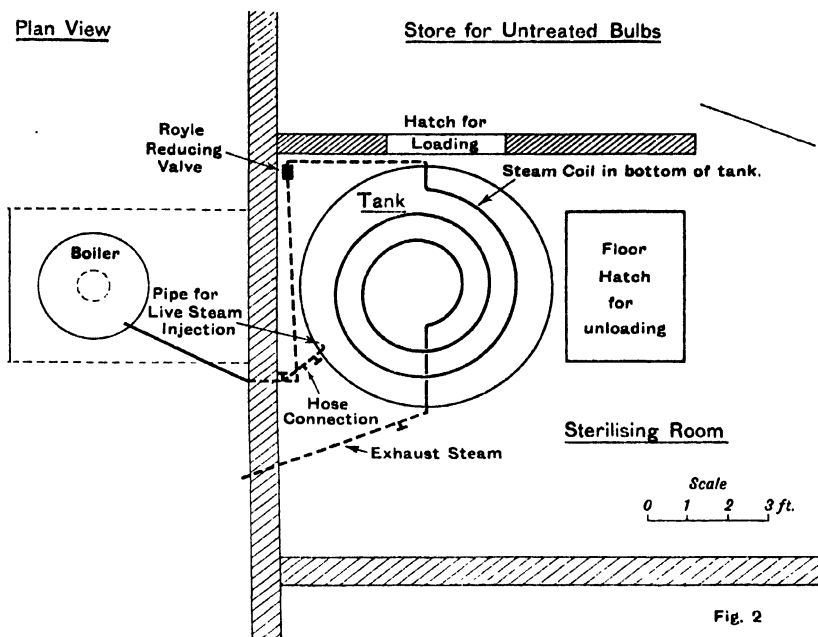


Fig. 2

draughts. A coating of cement is laid over the asbestos on the part of the tank projecting into the sterilizing room, to protect the asbestos from damage during the unloading of containers.

To facilitate loading and unloading, a "spider" or false bottom is provided. This merely consists of six radial arms of T-section iron, with the ends cranked over to make legs to raise the bottom of the crates a few inches clear of the coil. The framework is stiffened by a couple of concentric, flat iron rings. To the centre of the spider is attached a vertical spindle, with an eye at the top, level with the top of the tank. Into this eye can be fitted the hook of a differential chain tackle, carried on a traveller, which rides on an I-section girder fixed in the roof above the centre line of the tank and floor hatch. To prevent undue tilting of the spider when loading, three guides or hoops are fitted, connecting the top of the spindle with the outer ends of alternate arms of the spider. Owing to the buoyancy of the containers of bulbs, it is necessary to provide suitable weights to keep them under water: for this purpose three old iron fire-bars serve admirably.

A MODERN BULB BATH

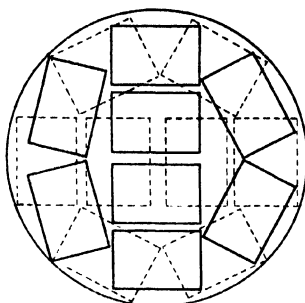
The containers are wooden crates, similar to lettuce crates, but lined with $\frac{5}{8}$ -in. wire netting. Their overall measurements are $21 \times 14 \times 14$ in. and each crate holds about 65 lb. of bulbs. Thirty-two crates go to each loading of the tank, so that nearly a ton of bulbs can be treated at a time. The crates are arranged in the tank in four layers of eight in the manner shown opposite. This allows free circulation of the water among the crates.

The method of operating the plant is to bring the water up to about 113° F. by injecting live steam. After cutting off the live steam, the coil is turned on and the spider is then hauled up to the top, the wall hatch opened and the crates of bulbs passed through and arranged in position on the spider, which can be rotated to facilitate this. As each layer of eight is completed, the spider is lowered slightly and after the last crate is in position the weights are arranged and the whole is lowered to the bottom. As soon as the loading is completed, the wall-hatch is closed. After treatment the process is reversed, except that this time the floor-hatch is open and the crates are swung on to the shute, from the foot of which a truck takes them away to be emptied into previously sterilized trays.

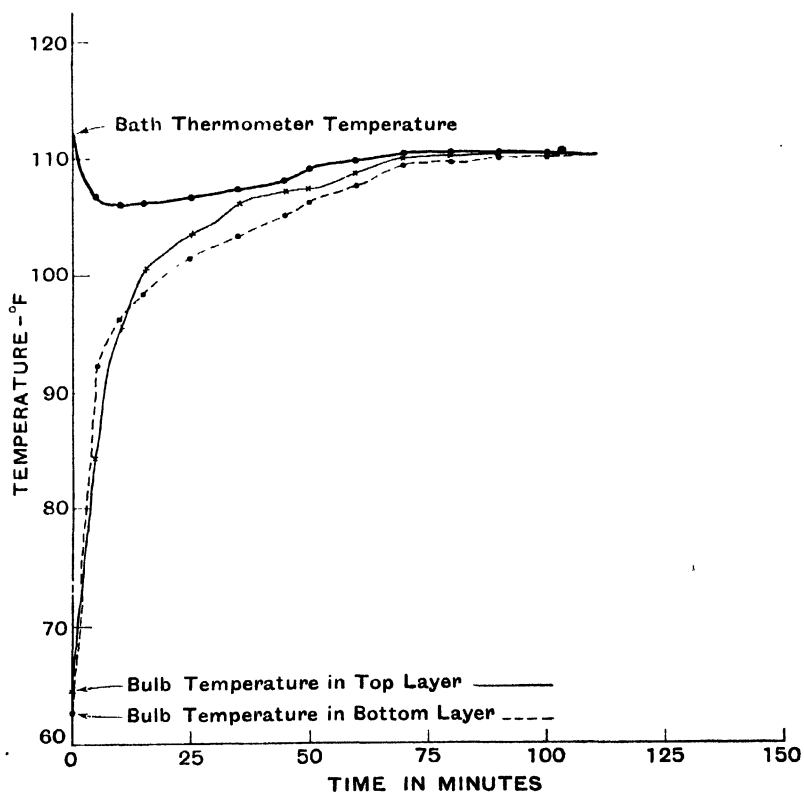
The capacity of the plant is unusually large, and provision is made for sterilizing the lorries that bring the bulbs to the farm by fitting a steam hose to the system.

The high efficiency of the plant, which is illustrated by the curve on p. 1143, kindly plotted by Mr. Staniland from the results of his test, is attributed to the following factors: the use of (1) crates in place of bags, which restrict the circulation of the water; (2) a cylindrical tank, which gives much more even distribution of heat than a rectangular tank; (3) ample lagging of the tank and protection from draughts; and (4) a large volume of water in proportion to the quantity of bulbs (in this case about 1,000 gal. to a ton of bulbs), making it much easier to maintain a steady temperature. It will be noted that no pumps, propellers or thermostats are used, adequate circulation and accurate control being obtained without these complications. No difficulty is found in keeping the temperature steady within half a degree of 110° F. The curve shows that about an hour was taken for the temperature of the bulbs to reach 110° . In practice, it has been found quite safe to bring up the temperature rather more quickly.

A MODERN BULB BATH



Dotted lines show position of crates in 1st. and 3rd layers.
Continuous lines show position of crates in 2nd. and 4th. layers.



A MODERN BULB BATH

The points to be noted to avoid re-infection are:—

(1) Rigorous segregation of treated from untreated bulbs, and strict enforcement of one-way traffic through the plant.

(2) Precautions such as the hatch coaming to prevent dust spreading disease.

(3) Sterilization of all trays, other receptacles and vehicles used for treated bulbs.

Formaldehyde is used to control fungus attacks and to reduce the time necessary to kill eelworm "wool" at 110° F.

FRUIT TREE SPRAYING IN 1936

J. TURNBULL,

Ministry of Agriculture and Fisheries.

A DEMONSTRATION in the Wisbech area in 1936 showed what can be done to obtain better results from existing spraying tackle, by substituting short lances and double nozzles, (giving a fine driving spray of long range) for the long lances formerly in general use. This demonstration was described in this JOURNAL for December last (pp. 846-854). Progressive fruitgrowers in many parts of the country, however, who have not been afraid to invest large sums in new spraying machinery, have advanced considerably beyond that. They are obtaining better results with greater certainty than was ever possible by the older methods, and are producing a high proportion of Extra Fancy apples. It is true that their capital outlay on machinery has been heavy, but even after making adequate allowance for interest and repayment of capital, there is a substantial reduction in annual expenditure.

Unfortunately, few fruitgrowers keep detailed accounts and records of their spraying. More would do so if they realized how much it would help them to improve their programmes and cut down expenditure. It was entirely owing to the detailed observations needed to arrive at the cost of spraying that the recent advances made in spraying have been attained. It is generally possible to ascertain the total quantities of each kind of material used on a farm, and sometimes the wages paid for spraying, but it is seldom possible to obtain the quantities used in each plantation for each spray. Detailed accounts cannot be prepared from such information if there is much variation, either in the plantations or in the spray programme used on different parts of the farm. Fortunately it has been possible to find several farms on which the trees and programme are fairly uniform, and which are in the possession of fruitgrowers able and kind enough to supply sufficient particulars.

The costs given below cover average bush trees and exceptionally large half-standards, sprayed by means of a central plant, and average half-standards sprayed by means of a large portable pumping outfit and portable pipes. It has also been possible to include some costs incurred while using the latest type of American spraying machinery. In every instance the costs are based on the spraying of 50 acres or

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more of bearing apple trees, but in order that they may be applied to any acreage they are shown on a "per acre" basis, and the prices of spraying materials shown are not the prices that were actually paid but the prices at which any farmer can buy the materials now. The quantities of diluted wash are worked out from the quantities of material and the strengths at which they were used. They have all been corroborated by the total amount pumped in a day and sometimes cross-checked by the quantities of accessory materials (e.g., "wetting agents") that were used. With lime-sulphur there is usually a variation in the quantities used at different stages of growth, but in the absence of detailed records it has only been possible to give an average figure for each spraying.

Bush Apples. Mr. W. Lawrence Taylor's farm at Galleywood, Chelmsford, consists mainly of bush apple trees. There are some plums and some young non-bearing trees which it has been possible to eliminate from the costs. The trees taken into account are all in bearing, one-third old trees and two-thirds between eight and twelve years old. A few of these are half standards, but the proportion is so low that they are disregarded.

Mr. Taylor was sceptical of the statement that from one-third to one-half of the men's spraying time was spent in moving portable pipes, and in 1935 he kept a record. He found that the total wages paid for moving the pipes and plant during the season amounted to £1 per acre. He decided to instal a central plant, with underground main and lateral pipes, and to spare no expense that seemed justified.

Rails were erected about 6 ft. above ground level outside the pumping station, which would hold sufficient barrels of material for a day's work, and along which the barrels could be rolled into the house and emptied into a receptacle, leading to a graduated measuring tank. Thence the material passes when required into one of two large spraying tanks, suspended in an excavated chamber (which permits ready access to any part of the tanks). Water is laid on and is run into these tanks through large strainers, in which substances, such as arsenate of lead, can be placed and washed in. The pump itself is double the size considered necessary at the moment, and is driven at half speed by means of an electric motor, geared directly to it. The working pressure is 400

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to 450 lb. per sq. in. and can be much increased, if found desirable. No lateral pipes are used with a diameter of less than 1 in., in order to avoid loss of pressure. Clear water is always pumped through the pipes for half an hour after spraying, to avoid sedimentation. A larger number of stand-pipes than usual has been put in (averaging $3\frac{1}{2}$ to the acre), in order to avoid the need for dragging the hoses diagonally through the trees, which, though satisfactory for half standards, is apt to lead to confusion in spraying the more closely-planted bush trees.

The total cost of this plant, allowing for all machinery and piping, labour for trenching in pipes, adaptation of building, etc., was heavy and amounted to £18 per acre, but who shall say it is not justified by results? Mr. Taylor is in a position to spray every apple tree on the farm in $3\frac{1}{2}$ days with tar oil, or in 2 days with later sprays. If the pump were speeded up and more men set to work, the whole could be sprayed in one day. This enables the very best moment for any spray to be chosen, so that it will have the maximum effect. The total number of days' spraying needed for the whole season's programme with this plant in 1936 was 12, whereas with a small plant in 1935 it took 85. •

In order to arrive at the cost of running such a plant it is essential to consider interest and repayment of capital. If the money had been borrowed under the Lands Improvement Act it could have been repaid with interest at $3\frac{1}{4}$ per cent. plus tax in 15 years by annual payments, equivalent to £1 12s. 6d. per acre. This appears to be a suitable basis, though the plant will obviously last much longer than that. The cost of current used by the motor in 1936 was $8\frac{1}{2}d.$ per acre. No repairs should be required in 15 years, beyond annual attention to the valves and plungers and occasional repainting of the tanks. This will amount to less than 2s. per acre per annum; 120-ft. rubber hoses, fitted with 2-ft. wooden handled lances and double nozzles cost £1 per acre, and if they only last 5 years this would amount to 4s. per acre per annum. The total cost of the plant, therefore, amounts to about £2 per acre per annum.

The spray programme consisted of tar oil at 6 per cent., 2 pre-blossom lime-sulphurs at $2\frac{1}{2}$ per cent. (the first with arsenate of lead at 4 lb. per 100 gal.), and 2 post-blossom lime-sulphurs at 1 in 150 (the first with arsenate at 4 lb., nicotine at 8 oz., and spreader at 4 oz. per 100 gal., the second with

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arsenate only). The double nozzles are of the design published in this JOURNAL for August, 1934, p. 433, but with a swirl plate modified by the omission of the central hole, it having been found that the finer spray this gives will carry far enough at these higher pressures. Size No. 4½ discs (.070 in.) were used, giving each double nozzle an output of 3 gal. per min. at 400 lb. pressure. Larger discs and 4 ft. lances were used for the half-standards. Each man sprayed 2.45 acres per day with tar oil and 4.15 acres with lime-sulphur, etc. Quantities and costs are given later.

Half-Standards. Mr. H. H. Tompsett of Marden, Kent, has grass orchards consisting almost entirely of half-standard apple trees standing 24 ft. apart. Some orchards are overlapping, some have average and some small trees. The quantities of tar oil used in each orchard in 1934 show that the small trees nearly make up for the very thick trees, and the whole, therefore, can very fairly be regarded as average.

The present plant consists of a high-powered portable outfit, capable of maintaining a pressure at the pump of 450 lb. per sq. in., and a set of portable pipes fitted with flexible couplings. The portable pipes are being scrapped and replaced by underground mains and laterals this winter. The total cost of the portable outfit and portable pipes amounted to £6 per acre. Allowing a life of ten years, the interest and repayment of capital is 15s. per acre. Repairs and replacement of flexible couplings will amount to about 3s. 6d. per acre per annum. Hoses 120 ft. long, fitted with 4-ft. lances and double nozzles cost about 12s. 6d. per acre, and allowing a life of 5 years the annual cost will be 2s. 6d. per acre. Petrol for the season's spraying amounts to about 4s. 4d. per acre. The total cost of this plant, therefore, works out at about £1 5s. 4d. per acre per annum.

The programme consisted of tar oil at 7½ per cent., a green flower lime-sulphur at 3 per cent. with arsenate at 4 lb. and spreader at 4 oz. per 100 gal., a pink bud lime-sulphur at 2½ per cent. with spreader (except on Lord Derby and some odd sorts), one post-blossom lime-sulphur at 1½ per cent. with spreader on all varieties, and a late post-blossom lime-sulphur at 1½ per cent. with spreader on some varieties only. The quantities used in 1936 cannot be ascertained, but Mr. Tompsett kindly supplied particulars for some sprayings in 1934 and 1935 from his records.

The spraying on this farm is of particular interest, because

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it is the only farm known to the writer on which the summer sprayings are done by the piece. Realizing that a man cannot work any faster than the nozzle output will allow him, permission was given to use larger discs, so long as material was not wasted. The price paid was 3s. per acre, including both the spraying and moving, but not including the foreman, who mixed the wash and minded the engine. Mr. Tompsett is satisfied that no waste of wash occurred and that the results are even better than in previous years.

Very Large Trees. Mr. A. J. Wooldridge's farm at West Peckham, Maidstone, presents almost as difficult conditions for spraying as it is possible to find. About two-thirds of the acreage consists of Bramleys, which are exceptionally large trees, standing 40 ft. apart and the majority touching each other. The remaining one-third consists mainly of very large spur-pruned Lord Derby, with a few more closely planted Lanes, etc. The farm has been heavily manured in the past and all the trees are much above normal size.

Mr. Wooldridge took over the farm in March, 1935, and found he was unable to control scab and capsid with the existing spraying plant. He installed a central spraying plant, with underground main and lateral pipes, in the winter of 1935-36. It is of the normal type, of which many have been installed in Kent during the last few years. The pump has a sufficient capacity to enable all the apple trees on the farm to be given the heavy spraying, which such large trees require, in 4 days. It is driven by a Diesel engine and a pressure at the pump of 450 lb. per sq. in. is maintained, though more can be had if necessary. Measuring, mixing and spraying tanks are installed outside the pump house (on account of the danger of poisoning when nicotine is handled in an enclosed space). The wash is pumped through underground mains and $\frac{3}{4}$ -in. laterals. It is contended that possible loss of pressure in these smaller pipes is counterbalanced by a reduced risk of sedimentation. The number of stand-pipes averages $1\frac{1}{2}$ to the acre. The cost of this plant amounted to £10 per acre, to which must be added the cost of labour for trenching in the pipes, estimated in this case to amount to 30s. per acre. The total cost was thus £11 10s. per acre.

The annual cost of the plant for interest and repayment of capital in 15 years is £1 os. 10d. per acre. The cost of Diesel oil used in 1936 came to 11d. per acre. Repairs should not exceed 2s. per acre per annum. Rubber hoses each 120 ft.

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long, fitted with 4-ft. lances and double nozzles, cost 12s. 6d. per acre, and this on a 5-year basis costs 2s. 6d. per acre per annum. The total annual cost of this plant, therefore, amounts to approximately £1 6s. 6d. per acre per annum. The Bramleys were sprayed with tar oil at 6 per cent., except one piece that had not been sprayed with tar oil before at 8 per cent., and this last piece received petroleum at 7½ per cent. later. Lord Derby and the others had partly tar-petroleum emulsion at 7 per cent. and partly miscible tar-petroleum at 6 per cent. All had 3 pre-blossom lime-sulphurs at 2½ per cent. with spreader at 5 oz. per 100 gal. All had one post-blossom lime-sulphur at 1 per cent. with spreader, some with arsenate at 4 lb. and some with nicotine at 8 oz. per 100 gal. The Bramleys had another lime-sulphur at 1 per cent. with spreader. Single adjustable nozzles were used for most of the tar oil, but a change was made to double nozzles, which were used for all subsequent sprays. The double nozzles were fitted with the 7-hole swirl plates (i.e., those including the central hole) and No. 5 (0.077-in.) discs, giving an output of 3 gal. per min. Each man sprayed approximately 2.6 acres per day with lime-sulphur.

Quantities and Costs. These are grouped together here for the purposes of comparison. The quantities, given in gallons of diluted wash, used to spray an acre of trees at pressures of 350 to 450 lb. per sq. in., give an idea of the effect on cost of trees of different size and thickness and are as shown in Table I.

TABLE I

Trees	Nozzles	Tar oil	Mixed tar-petroleum	Petroleum	Lime-sulphur, etc.
Bush—Average size	Double	440	—	—	255
Half-Standard :					
Small	Single	323	—	—	200A—216B
Average	„	408	—	—	235A—180B
„	Double	327	—	—	—
Very thick ..	Single	593	—	—	400A—255B
„	Double	540D	—	—	—
40-ft. Bramley ..	Mostly single	738	—	—	} 365
Not quite so big, spur-pruned ..	Double	—	820C	—	
Very large, not sprayed before	Single	1000	—	388	
Cherries—Very tall	„	667	—	—	—

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NOTE.—A. Green-bud stage, intended to be sprayed thoroughly. B. Post-blossom, intended to be sprayed lightly. C. Part sprayed with tar-petroleum of emulsion type (808 gal. per acre) and part with similar wash of miscible type (832 gal. per acre); average 820 gal. per acre. D. Sprayed in very windy conditions.

It will be seen that there is little difference in the quantities per acre required by bush and half-standard apple trees, when they are of average size and density. If half-standards are very large, or very thick (overlapping), the quantity is 50 per cent. greater, or even more. This probably applies to bush trees as well. It is well known how trees that have not been sprayed with tar oil before seem to absorb this wash, and this is shown by the very high figure. It is curious that the very tall cherries took slightly less than the very large and rather dense, though not so tall, Bramleys. Probably the latter had more wood in them. The comparative figures for adjustable single and fixed double nozzles with the right type of spray were obtained in consecutive seasons in the same orchards. It will be observed that the saving was 20 per cent. on average trees and only 9 per cent. on very dense trees, but with the latter the conditions were very windy when the doubles were being used. Unfortunately the figures do not throw much light on the vexed question of the comparative costs of applying tar oil and petroleum as two separate sprays, or as one mixed spray. The trees that received the separate sprays were larger and were sprayed with nozzles that use more wash. It is rather remarkable that, even with these disadvantages, they did not need so much tar oil as the smaller trees needed of the mixed oils. The emulsion and miscible oils both needed the same quantity, which is not usual and is probably accounted for by the make-up of the oils. It needed less than half the quantity of petroleum (following tar oil) that it did of either mixed oil, in spite of the fact that the former trees were larger. This is in accordance with general experience, though it is by no means generally realized. The quantity of lime-sulphur varies appreciably at different stages of growth, but the average is about 55 per cent. of the quantity of tar oil needed for the same trees. On two of the farms the post-blossom lime-sulphurs were applied thoroughly, but at weaker strengths. On the other farm they were applied lightly at greater strengths.

The total costs per acre of carrying out the different programmes, under the different conditions and with the different machinery described, and charging the materials

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at current prices, instead of actual cost, were as shown in Table II.

TABLE II

	Average bush trees, central plant	Average half-standards, portable plant, piecework	Very large trees, heavy programme, central plant
Tar oil, mixed oil and petroleum	£1 12 1	£1 17 7	£3 7 11
Lime-sulphur	16 6	1 1 0	1 13 6
Spreader ..	1 5	6 2	12 5
Arsenate ..	14 3	4 7	3 1
Nicotine ..	10 0	—	8 0
MATERIAL	£3 14 3	£3 9 4	£6 4 11
LABOUR ..	10 11	1 4 0	1 1 10
PLANT ..	2 0 0	1 5 4	1 6 6
TOTAL	£6 5 2	£5 18 8	£8 13 3

These costs show a substantial reduction on what was considered possible a few years ago, and it is now beyond dispute that the work has been done with less trouble and with far better results. This is not the place to discuss the technical aspects of the spray programmes used, but in order to avoid misunderstanding it is desirable to mention that on certain parts of certain orchards, consisting of highly manured Bramleys, a small proportion of the apples was attacked by late scab. This need not have occurred. In the writer's opinion, varieties subject to late scab should always be given a weak spray of lime-sulphur about the middle of July, when conditions of manuring or rainfall are such as to favour development of the disease.

American Methods. Messrs. R. and B. Dixon have an extensive acreage of fruit at Teynham. A large proportion consists of cherry orchards, which require spraying with arsenate of lead at the same time as the pink-bud and petal-fall sprays have to be applied to apples. In order to be able to complete all of this work at the right time, they acquired, in March last, in addition to their central spraying plant, one of the latest type of American spraying outfits. As they do not use it in the same manner as in the U.S.A., and as they have only used it for part of a season, it is impossible to present the costs in a manner comparable with the others, but such experience as has been gained with it is of interest.

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The outfit presents somewhat the appearance of a motor car. Behind the radiator and under the bonnet are placed an 8 h.p. petrol engine, and behind that a high-speed pump and pressure regulator. Behind that again is an almost cube-shaped tank, holding 250 Imperial gallons, through which passes the axle holding the rear wheels. The special feature of this outfit is its very light weight, the engine, pump and pressure regulator together weighing only $4\frac{1}{4}$ cwt. The complete outfit, fitted with rubber tyres, costs £295. It is drawn up and down the rows by tractor, which must be available when this method is used. Water has now been made available at a number of stand-pipes, and a portable 500 gal. tank is filling up at one of these while spraying is in progress.

The annual cost of interest and repayment of capital, allowing a life of 5 years, is £67. Repairs should not exceed £5 per annum, making £72 in all. Petrol costs 3s. and tractor 18s. per day. Mr. Dixon reckons his tractor costs at 1s. 6d. per hour, but the more usual figure of 2s. per hour has been taken. Assuming 24 days' work in a season, these two items amount to £25 4s. Hoses and lances are included in the original cost and should last 5 years, so that no special charge is made for them. The total annual cost thus amounts to £97 4s. The annual cost*per acre depends upon the number of acres sprayed. In this instance, owing to the small quantities of wash used, it covers 54 acres for the season, and the annual charge amounts to £1 16s. per acre.

When spraying, one man drives the tractor and two men spray. Both ride on the outfit. Each uses a 4-nozzle lance and the total output is 12 to 16 gal. per min., at a pressure *at the nozzle* of 500 lb. per sq. in. This method is found more effective than one man using an 8-nozzle lance. A point of particular interest to the writer is that the type of spray employed is almost identical with that evolved independently by him, modified to suit the higher working pressure. Another feature is the instantaneous cut-off provided on the lances. This works very easily and is estimated to save 25 per cent. of material.

Mr. S. R. Dixon, who supervises the spraying and keeps detailed records of it, has kindly supplied the information given in Table III.

The table shows that the average quantity used for each spraying amounted to 114 gal. and the wages (3 men at 2s. 6d. per hr.) to 1s. $7\frac{1}{2}$ d. per acre—a very low figure, to

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TABLE III

Spray	Trees	Age: Years	Acres	Gal.	Time for 3 men (hours)	Gal. per acre
Pet. emul. ..	Apples, h.-standard	17	3 $\frac{3}{4}$	530	3	142
Lime-sul. (1st)	Pears, standard ..	25A	5	750	4 $\frac{1}{2}$	150
	„ dwarf ..	10B	3	500	2 $\frac{1}{2}$	166
	„ standard ..	26C	2	600	1 $\frac{1}{2}$	300
	Apples	D	15	1400	9	94
	„ and pears	15 & 30E	17	1500	12	90
„ (2nd)	Pears, standard ..	A	5	700	6 $\frac{1}{2}$	140
	„ dwarf ..	B	5	850	3 $\frac{1}{2}$	170
	„ standard ..	C	1	250	2 $\frac{1}{2}$	250
	Apples	D	15	1400	7 $\frac{1}{2}$	94
	„ and pears	E	23	2500	13 $\frac{1}{2}$	110
	Cherries	15	6	250	1	42
Arsenate ..	„	30	13	1820	9	140
	TOTALS ..	—	114	13050	74	—

NOTE—The letters indicate orchards that were the same for each spray, though all the trees may not have been sprayed both times.

which reference will be made later. It will also be seen that the average quantity of spray used was 176 gal. per hr., although the actual output at the nozzles was 12 or 16 gal. per min. Too much time was taken up when not spraying, but various improvements in the arrangements for obtaining water, etc., have been made, and should lead to better results in future.

It is difficult to arrive at the total annual cost per acre of spraying apples, but on the assumption that half the normal quantity of material was used on each occasion, it was approximately as follows:—

	£	s.	d.
MATERIAL	2	0	0
LABOUR	0	11	5
PLANT	1	16	0
TOTAL ..	£4	7	5

The total cost is far below that of the other methods, but reflection will show that this is entirely due to the very small quantity of wash used.

It has been found possible with this outfit to average nearly 14 acres per day, using about 114 gal. per acre. If the normal quantity of 250 gal. per acre were applied, it would

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be necessary to use an outfit of double this capacity for this acreage, and, allowing a life of 5 years, the annual cost would be very high. It follows, therefore, that the crux of the matter is whether this very light spraying gives a good enough control of pests and diseases. All that can be said at present is that Mr. Dixon is satisfied with the results. Any new method, however, requires trying out in several different kinds of seasons and under different conditions, before it can be considered to have proved itself. In view of the initial results, future performance will be followed with great interest.

Observations. The problem of how to carry out the heavy spraying programme, now required for producing high quality apples and pears on bush and half-standard trees in full bearing, by means of the labour staff usually to be found on fruit farms and quickly enough to be effective, has now been solved by the provision of improved equipment. The capital cost of this equipment is heavy, but the annual expenditure has been substantially reduced. Taking as a standard the need for spraying all the apple trees on a farm in 4 days at the pink-bud and petal-fall stages, the capital cost of the different systems can be stated. It is approximately £12 per acre for a central plant with underground pipes, although considerably more has been spent on one particular orchard. It is about £6 to £8 per acre for either a portable plant with portable pipes, or the American mobile system, but this figure does not include the cost of laying on water to each plantation, which will often amount to £2 per acre, nor does it include any part of the cost of the tractor, which is required in the latter case. The merits of the different systems are a matter for debate, but the writer has no hesitation in expressing his own opinion. The mobile system is invaluable for dealing with young plantations, where there is a relatively long way to go from one tree to the next and with old orchards consisting of very tall trees, when it is an advantage for the sprayman to be standing on top of the outfit. For profitable orchards and plantations of bearing trees, however, the extra cost of underground pipes (partly paid for by the smaller plant needed) appears to be thoroughly justified by the extreme simplicity of working the system and consequent freedom from mistakes.

If the annual costs are compared with 5 years ago it will be seen that there is a substantial reduction. Taking an

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average programme, the cost of material is 25 per cent. lower. The cost of labour is from 50 to 75 per cent. lower, according to the kind of plant installed. The capital outlay on plant is greater, but taking the annual cost of this together with labour the combined cost is still lower than it was. In spite of this saving in expenditure the results are infinitely better. As regards the very large trees quoted, it was impossible to obtain good control of pests and diseases with the machinery available 5 years ago, but it is done to-day.

The quantities of wash now found necessary are less than those used 5 years ago by fruitgrowers who did actually control pests and diseases. Some fruitgrowers may dispute this, but the fact is that either they do not know what quantity they use, or they are not obtaining control. The average quantity of lime-sulphur used—250 gal. per acre on average trees—is in fact a small quantity, and this is due to the type of spray used. Dr. T. Swarbrick, of Long Ashton Research Station, considers this quantity inadequate, but it should be pointed out that his spraying must be carried out under exceptionally windy conditions, and that such conditions necessitate the use of a coarser type of spray (such as is given by a gun) so as to obtain greater wind resistance. In such conditions it is obvious that a larger quantity of wash will be required and a larger plant will be needed for the same acreage.

The reduction in the amount of labour has been brought about by the use of larger nozzle outputs, the effect of which was first demonstrated on a large scale at the Commercial Fruit Spraying Demonstration carried out at West Farleigh, nr. Maidstone, in 1932, and described in the 1932 edition of the Ministry's Bulletin No. 5. The actual output of the double nozzles used on the farms quoted was approximately 3 gal. per min. Larger outputs are in use on some farms for half-standards, but detailed costs are not available. The output of the multi-nozzle lances used with the American machine vary from 6 to 16 gal. per min., but the men ride on the machine. The use of a large nozzle output is important, because, combined with the use of a plant large enough to supply them, it brings the carrying out of an extensive spray programme within the powers of the number of men available on the farm.

Sufficient information is available to show the number of men and capacity of spraying plant needed to obtain satis-

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factory results under varying conditions, when these methods are used. The most critical times for spraying apples are at the pink-bud and petal-fall stages, and it is now generally agreed that it must be possible to spray all the apple trees on the farm at these stages in 4 days. Bearing in mind that each sprayman can cover $2\frac{1}{2}$ acres with a portable plant and 4 acres with a central plant in a day, when using a nozzle output of 3 gal. per min., and allowing one man for mixing, Table IV shows the acreage of fully grown trees that can be sprayed in 4 days by the different methods:—

TABLE IV

No. of men	Pump capacity. Gal. per hr.	Engine h.p.	Portable plant, portable pipes. Acres.	Central plant, underground pipes. Acres.
2	240	2	10	16
3	480	4	20	32
4	720	6	30	48
5	960	8	40	64
6	1,200	10	50	80
8	1,680	14	—	112
10	2,160	18	—	144

NOTES.—When dealing with large-size portable plants it is impossible for one man to do the mixing, unless suitable means for handling the barrels and water are available. Further, unless water is laid on, an extra man will be needed for carting water. If all the trees on the farm are very large or very thick, or if a heavier type of spray is used, the pump capacity may need to be 50 per cent. greater.

The difference between the quantity sprayed by means of portable and central plants is due to the amount of time wasted in moving portable pipes. If a longer period than four days could be allowed without prejudicing results, the acreage that could be sprayed by any machine would be correspondingly increased. If, on the other hand, it is thought desirable to be able to finish one spraying in two days, the cost of the plant will be increased, and the number of men required will be one to 7 acres.

No satisfactory costs of the American system (i.e., with men riding on a travelling machine) are available at the moment. The chief difficulty with this system is the time wasted in filling up the machine, when the tank is empty. This can, however, be made up by the very large nozzle output that a man can use, when riding. There does not appear to be any limit to this, other than the limit of the weight of the necessary amount of machinery and spray liquid which must be carried to make the use of a very large pump worth while.

THE CHRYSANTHEMUM MIDGE*

THE Chrysanthemum Midge has been known since 1915 as a serious pest of greenhouse chrysanthemums in North America, and it has been found attacking these plants on three occasions in Europe—twice in England and once in Denmark. In England the outbreaks, which were discovered in 1927 and 1936 respectively, were traced to chrysanthemum varieties imported from the United States: the origin of that in Denmark, which occurred in 1934 in two nurseries near Copenhagen, is not definitely known, but it is probable that in this instance also the pest was brought in with imported plants.

When the Midge was first discovered in America it was recorded under the name of a European species,† known since 1885 as attacking the roots of various kinds of Ox-Eye Daisy. This original identification, however, seems to have been accepted in Europe without further investigation and without experimental evidence to show whether the daisy midge will in fact attack greenhouse chrysanthemums. In view of the difference in habit between the two insects, it is not improbable that they may prove to be distinct species. However this may be, it is clear that from the horticultural point of view the Chrysanthemum Midge must be regarded as a foreign pest, and since its establishment in this country would add greatly to the cost of growing chrysanthemums, it is most desirable that this should be prevented from happening. The Ministry of Agriculture and Fisheries has power to deal with outbreaks under the Destructive Insects and Pests Order of 1933, and growers are requested to inform the Ministry if they notice on their plants any of the symptoms described below.

The injury caused by the Chrysanthemum Midge is due to the feeding of the larvae within the tissues of the plant, as a result of which conspicuous cone-shaped galls are produced. Where the infestation is slight, these galls are found only on the leaves (Fig. 2), mainly on the upper surface, but also occasionally on the underside. In severe attacks, however,

* *Diarthronomyia* sp.

† *Diarthronomyia hypogæa*, F. Löw.

CHRYSANTHEMUM MIDGE

the stems, buds, and developing flowers are also affected (Fig. 3), giving rise to severe distortion and stunting of the plants. The flowers will be poor in quality and reduced in numbers, and little or no growth for cuttings will be produced. Galled cuttings do not root readily, and in any event produce weakly plants.

The adult midge (Fig. 1) is a very small reddish-yellow fly, not more than $\frac{1}{10}$ in. in length, with long legs and antennae. The flies usually emerge from the pupae in the very early hours of the morning, between midnight and 5 a.m. Pairing takes place almost immediately, and egg-laying, on warm days, is completed by mid-day, though in colder conditions it may be more protracted. The males die soon after pairing and the females shortly after egg-laying: the adult life is thus very short, occupying only one, or at most two days.

The eggs are exceedingly small, being practically invisible to the naked eye. They are oval in shape and of a reddish-orange colour: 80-150 are laid by each female. They are deposited in groups on the growing parts of the plants, usually on the small hairs on newly-developing leaves. In from four to twelve days the eggs hatch, giving rise to minute whitish larvae or grubs. Soon after hatching, these grubs, which are legless and oval in shape, burrow into the tissues of the plant, where they feed, causing the characteristic galls to appear. The galls, which are at first indicated by a lighter patch on the leaf surface, show distinctly about ten days after the grub has entered the tissues. The length of the larval stage varies with the time of the year: in early spring and autumn, three to four weeks is the usual period, but development is much slower in summer and winter. When full-fed the grubs change to oval brownish puparia in the galls, where they remain quiescent for about ten days. At the end of this period the pupa pushes itself half way outside the gall and the adult emerges.

Breeding goes on continuously during the year, but is greatly retarded in summer and in winter, when the larval stage is protracted. The chief periods of activity are in early spring, when cuttings are being taken and rooted, and in autumn when the flowers are developing. During these two periods the infestation increases very rapidly, and unless checked will cause serious loss of cuttings and of marketable blooms.

In America, where the pest has become established over

CHRYSANTHEMUM MIDGE

a wide area, routine control measures against the midge have had to be adopted by a large number of chrysanthemum growers in order to obtain healthy cuttings and marketable blooms. As the plant tissues largely protect the larval and pupal stages from the action of insecticides, control measures have been mainly directed against the adults and eggs. Both of these are susceptible to the action of nicotine, and the former also to that of hydrocyanic acid gas, but whichever stage is dealt with treatment must be frequent and thorough. To kill the adults before eggs have been laid fumigation must be carried out each night throughout the active seasons of the midge: for this purpose either hydrocyanic acid gas or nicotine is suitable, but measures against the egg stage are those most frequently employed. A suitable spray consists of nicotine 95-98 per cent. at a strength of 1 part to 800 parts of water (i.e., 2 oz. per 10 gal.) with the addition of sufficient soft soap or other spreader. As the eggs may hatch four days after deposition, spraying must be carried out twice a week during the periods of maximum activity of the midge, that is to say for a period of six to eight weeks in spring and a similar period in autumn. Considerable expense both in labour and material is thus involved.

In this country, where the Midge has not yet become established, it is necessary to employ more drastic methods in the hope of eradicating it altogether. The precise measures to be adopted in any given instance are stated in the Notice under the Destructive Insects and Pests Order of 1933 that is served on the owner or occupier of the affected nursery, but their general nature is as follows:

A. In Nurseries where the Ordinary Commercial Varieties are grown for the Flower :—

1. All galled leaves must be removed and burnt.
2. No flowers showing galls on the leaves or stems may be marketed.
3. After flowering all plants must be destroyed by fire. No cuttings shall be taken, and after all plant refuse has been removed the houses must be left vacant for a period of at least 14 days.

B. In Nurseries where New or Valuable Varieties are grown :—

In addition to the methods under 1 and 2 above

3. Spraying with a nicotine wash (as indicated previously) shall be carried out twice a week in spring and autumn.
4. After flowering, all tops must be cut down and burnt. Cuttings shall not be taken from heavily infested plants, and no cuttings showing galls may be rooted. Before planting, all cuttings must be dipped in the nicotine wash.
5. No cuttings or stools shall be distributed from the nursery except by permission of an Inspector.

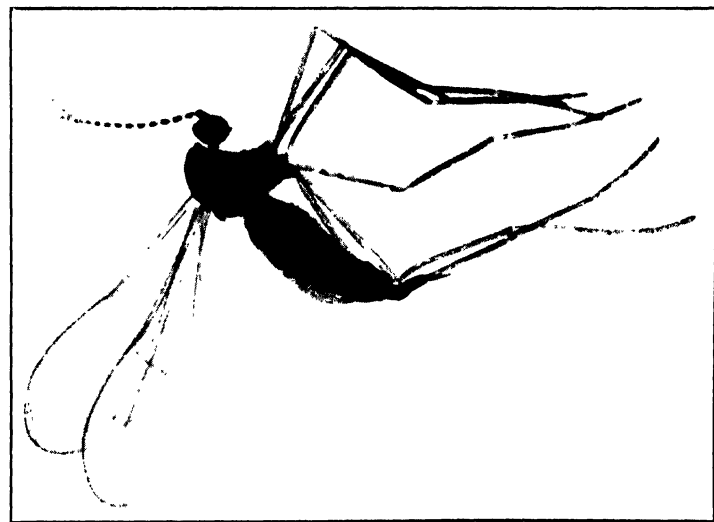


FIG. 1.—Chrysanthemum Midge
(highly magnified).

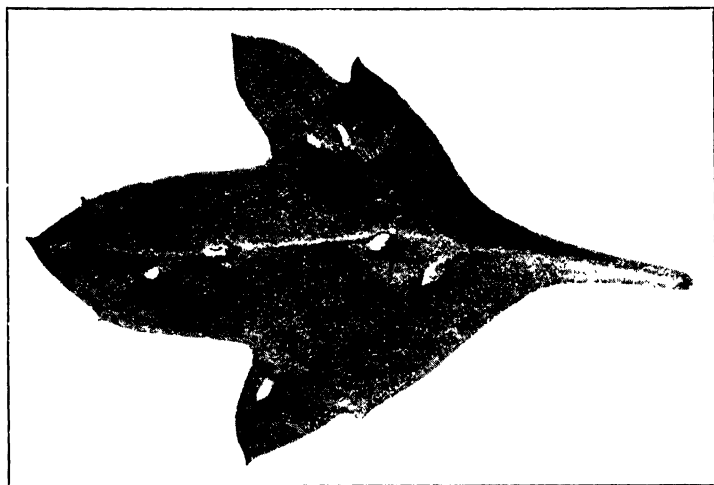


FIG. 2.—Galled Chrysanthemum Leaf.

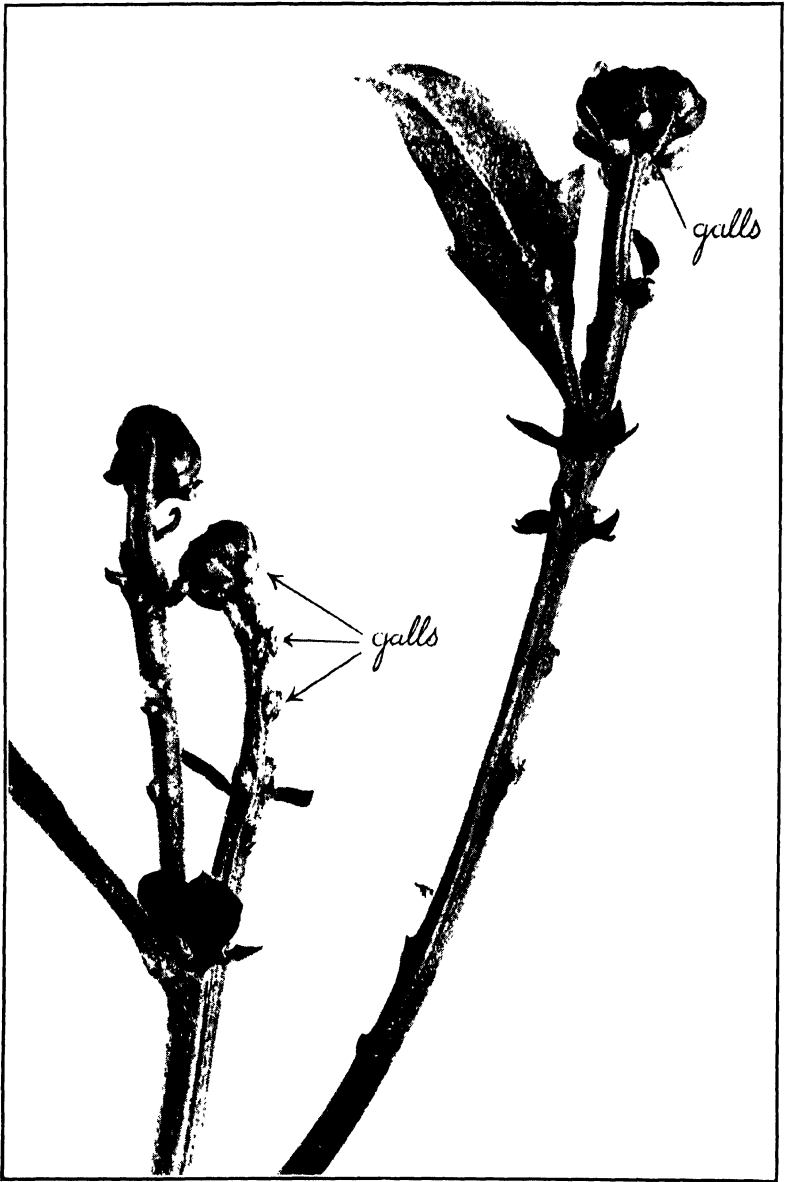


FIG. 3.—Distorted Chrysanthemum Stems and Buds.

CHRYSANTHEMUM MIDGE

In conclusion it should be emphasized that the Chrysanthemum Midge is a troublesome pest, which if firmly established could only be controlled at considerable cost to the grower. The longer a colony is allowed to persist the greater the expense and trouble in dealing with it, and, therefore, it is in the interests of all that outbreaks should be speedily discovered and notified to the Ministry. .

THE CONTROL OF POTATO BLIGHT IN JERSEY

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FOR several decades the early potato crop has been the mainstay of agriculture in Jersey. About 9,000 acres (nearly one-third of the Island) are planted annually, and the value of the export crop was £979,594 in 1935 and £845,446 in 1936. Planting begins in January and is going forward rapidly in February. The produce is dug and shipped to England between late May to early July, the peak period being during the first or second week in June. Part of the crop is reserved for seed and this is lifted late in June or early in July, after the grower has finished marketing.

The crop suffers from various diseases and pests, but of these Blight, due to *Phytophthora infestans*, is by far the most serious. Only one variety is grown, *International Kidney*,* and this is very susceptible. The disease is also favoured by the mild, humid climate, sea fogs, liberal manuring, close planting and the extensive area planted. Small, isolated out-breaks usually appear in May, but the disease is seldom prevalent until June, and crops harvested towards the end of the season are apt to suffer most. Disastrous epidemics often develop quickly and cause heavy losses; in one experiment 2,665 tubers were dug from a blighted crop and of these 808 were already visibly diseased and a further 1,099 developed disease in storage. ❧

In general, the losses caused by Blight may arise in three ways: (a) decreased yield, (b) disease developing in the tubers subsequent to lifting, and (c) Blight present and obvious in the potatoes at digging time. Decreased yield consequent upon the premature killing of the haulms by disease is not important in Jersey. The chief loss arises from Blight that develops in the produce after lifting. The tubers are apparently sound when dug and packed for export, but they develop disease in transit. As will be shown later, it is not uncommon to lose more than one-half of the produce in this way. The presence of such produce on the markets has far-reaching consequences, since it leads to decreased

* Also known as Boston Early and Jersey Royal.

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demand and lower prices; the loss is not confined to the individual grower, but is sustained by all, including those who are marketing sound produce. The development of disease after lifting occurs also in the seed tubers, and sometimes leads to such an acute shortage of the favourite local variety that other less desirable varieties have to be imported to complete the plantings. The third source of loss is the visibly diseased tubers present at digging time (see Fig. 1). One-third of the crop may be affected, but as these potatoes are discarded in the field they do not influence markets and prices, and the loss is restricted to the particular grower.

The following account of the progress made towards solving the potato Blight problem in Jersey may be of interest to growers of early potatoes elsewhere. It should be remembered, however, that the crop is marketed as soon as it is lifted, and that at harvesting time the haulms are green and the tubers immature. Thus the problem differs from that connected with late crops, where mature tubers are dug after the haulms have died down and where the produce is often stored before it is marketed.

Source of Infection. This was determined by lifting potatoes from crops in various stages of attack. The number of diseased tubers present in the field at digging time was noted, and apparently healthy potatoes were stored and examined later. The results were as follows:—

- (a) *Healthy Crops.* No diseased tubers in the field or subsequently in storage.
- (b) *Recent Attack.* In these instances the haulms were still green, but Blight was prevalent on them and the fungus was sporulating freely. Harvesting at this stage gave little or no loss in the field, but it was quite common for 50 per cent. or more of the tubers to develop Blight in storage as shown in Table I.

TABLE I

<i>Date Dug</i>		<i>Date Examined</i>		<i>No. of Tubers</i>	
				<i>Healthy</i>	<i>Diseased</i>
31.6.32	.. ..	14.7.32	.. ..	22	108
26.6.33	.. ..	3.7.33	.. ..	47	147
24.6.32	.. ..	30.6.32	.. ..	80	114

Nearly the whole of this disease was due to contamination of the potatoes by fungus spores present on the haulms and in the soil at lifting time. This was demonstrated by immersing some of the produce in 1 per cent. formaldehyde solution (1 pint of commercial, 40 per cent., formalin in 99 pints of water) soon after lifting; the treatment kills the spores on the outside of the tubers. Typical results are given in Table II.

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TABLE II

<i>Date Dug</i>	<i>Treatment</i>	<i>Date Examined</i>	<i>No. of Tubers</i>	
			<i>Healthy</i>	<i>Diseased</i>
29.6.36	.. Undipped	.. 16.7.36	.. 232	404
29.6.36	.. Dipped ..	.. 16.7.36	.. 152	13
4.7.36	.. Undipped	.. 20.7.36	.. 309	264
4.7.36	.. Dipped ..	.. 20.7.36	.. 80	3

(c) *Old Attack.* Here the haulms had been completely killed by Blight and were dry and shrivelled. The loss in the field was often serious, amounting in many instances to one-third of the crop. Where the haulms had been dead for two or more weeks the potatoes that were healthy at digging time usually remained sound on storing.

Prevention of Loss in the Field. The results outlined above suggested that this loss could be eliminated by delaying the appearance of Blight on the haulms until nearer digging time. Experiments and practical experience in the field showed that this may be achieved by timely and thorough spraying with the usual Bordeaux or Burgundy mixtures. It is advisable to spray at fortnightly intervals from early in May (when the plants are 8-10 in. high) to late in June; in wet seasons extra applications are necessary. By starting when the plants are small the lower part of the haulm, which is most likely to be attacked first, is protected; subsequent sprayings replace that washed off by rain and cover the new foliage. Probably the commonest mistake made by growers is to omit spraying until Blight appears. At this time the plants are tall and dense and it is impossible to cover the haulm, especially the lower half, satisfactorily.

In some years spraying ensures a sound crop and no further precaution is required. In many seasons, however, it merely postpones the appearance of Blight on the haulms until near digging time, but this delay is sufficient to eliminate loss in the field.

Prevention of Loss Caused by Contamination on Lifting.

As already mentioned, this is by far the most serious aspect of the problem. The produce appears to be perfectly sound when dug and packed for export, but Blight develops on it subsequently. The same applies to the seed retained by the grower.

Although spraying delays the onset of disease, it is quite usual for sprayed crops to be attacked late in the season, so that the tubers are contaminated at lifting time. Many growers have experienced such loss, and have, therefore, given up spraying. It is clear that spraying is not always sufficient and that some additional precaution is necessary.



Photo: Dr. T. Small.
FIG. 1.—Loss in the field, showing diseased potatoes left on the field at lifting time.

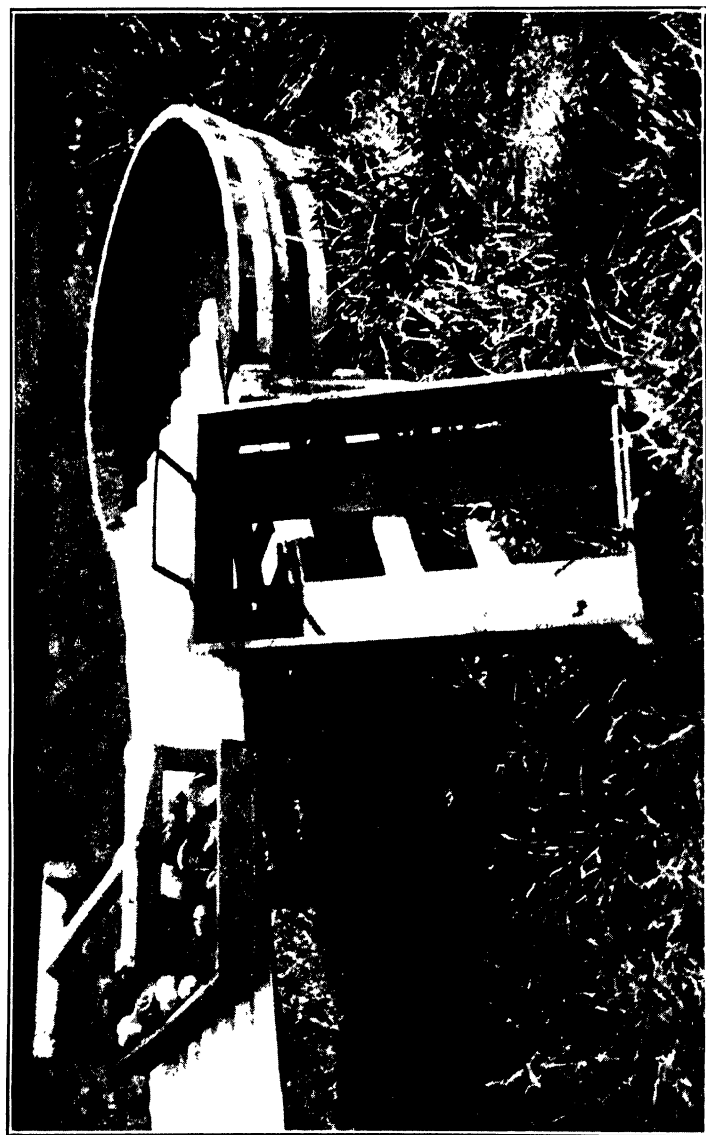


Photo : Dr. T. Small.

FIG. 2.—Apparatus for dipping seed potatoes.

CONTROL OF POTATO BLIGHT

It may be noted here that the grower cannot always postpone lifting until the disease has killed the haulms; the crop must be harvested so that valuable second crops, such as tomatoes or roots, may be planted.

The fact that spraying postponed the onset of disease, if only for a period of ten to fourteen days, was seen to be of the utmost importance in Jersey because it allowed sufficient time for an excellent crop of tubers to be formed before Blight appeared. Once this stage had been reached the destruction of the haulm whilst healthy, or, at the latest, when disease first appeared, would ensure healthy produce. Two obvious methods of destroying the haulms were tested, (a) scorching, and (b) cutting.

Scorching the Haulms. In earlier experiments a mixture of 12 lb. copper sulphate and $\frac{1}{4}$ lb. caustic soda in 40 gal. of water was used. Good results were obtained in sunny weather, but sometimes two applications, with a three-day interval, were essential. In 1936 dehydrated copper sulphate, in the form of a dry powder, was tried under various conditions, and the resulting scorch was similar to that obtained with the above spray. In the writer's opinion neither this spray nor the dust was as effective as sulphuric acid.

Sulphuric acid (Brown oil of vitriol S.G. 1.70) was tested in 1935. In sunny weather and on crops where the haulms are not tall and dense, 3 gal. of acid in 37 gal. of water applied at the rate of 80 gal. per acre are sufficient to scorch the green haulms in Jersey. In dull weather or where the growth is luxuriant, 5 gal. of acid should be added to 35 gal. of water. The addition of spreaders has so far failed to increase the effectiveness of the spray.

Many acres for market and for seed were treated in 1935 and 1936. No harmful effects have been recorded except that where scorching was carried out two to three weeks before lifting, a few more "greened" tubers were present. Tubers from seed crops treated in 1935 sprouted normally the next season. Some growers are so pleased with the results that they intend to use the acid spray every year, whether Blight is present or not. The crop, which is dug by hand and on a piece-work basis, can be lifted far more quickly after scorching.

Cutting the Haulms. A few growers prefer this older method. The haulms are not removed from the field, but are left on the ground, where they become dried and shrivelled in a few days. The method is practicable in Jersey,

CONTROL OF POTATO BLIGHT

where the farms are small and where four rows of the closely-planted crop may be cut at one sweep of the scythe. The method is effective provided it is carried out at the proper time.

Summary of Recommendations. In most seasons the loss in the field, as well as that caused by contamination of the tubers on lifting, may be almost entirely eliminated from the early potato crop in Jersey by adopting the following precautions:

1. Spraying thoroughly with the usual Bordeaux or Burgundy mixtures at approximately fortnightly intervals, beginning when the plants are 8-10 in. high. This will delay the appearance of Blight on the haulms until a good yield of tubers has formed.

2. Once this stage has been reached the haulms should be scorched or cut either whilst they are healthy, or, at the latest, as soon as the disease appears. The crop may be dug immediately after the haulms have been destroyed.

Practical Application. The above recommendations have been acted upon by practical growers, and many examples could be quoted to demonstrate how Blight has been reduced to negligible proportions in both export and seed crops. The following results, obtained by a grower who had given up spraying, will serve as an illustration. The case is interesting because it is so typical of what occurs in Jersey if precautions are not taken.

The trial was carried out in a $5\frac{1}{2}$ -acre field, half of which was left unsprayed while the other half was sprayed twice with Bordeaux mixture and dusted once with a dry powder. Before starting to spray, the latter half was cut down by frost, after which a quick and luxuriant growth developed. In spite of this the haulms were kept healthy by spraying until late in June. Spraying delayed the appearance of the disease by about 12 days, and when the writer inspected the field on June 29, Blight was well advanced on the unsprayed crop while very few spots were present on the sprayed plants. On this date the sprayed half, except for a few perches, was scorched with sulphuric acid.

On July 1 lifting began on the unsprayed plot, at which time the haulms were quite dead. At least one-third of the crop was Blighted at digging time and a further substantial loss occurred when the apparently healthy tubers were stored; most of the latter was probably caused by contamination from the soil at lifting time.

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The few perches that were sprayed but *not* scorched were also dug on July 1, and by this time the disease had spread and was active on the haulms. No Blighted tubers were found at harvesting time, but more than one-third developed disease on storing in seed boxes. This loss is common in sprayed crops that are attacked by disease near lifting time. If the produce had been exported, the disease would have developed in transit to the markets as previously explained.

The sprayed and scorched crop was lifted on July 7, when a yield of more than 15 tons per acre was obtained. Not a single diseased tuber was present, and the potatoes remained sound in storage. The grower estimates that the spraying resulted in a saving of £100 on this small area.

Treatment of Diseased Crops. When the above precautions have not been taken and Blight has become prevalent, some loss is almost inevitable, but the question arises whether it is possible to reduce this loss. Circumstances may compel the grower to lift the crop, although he knows from experience that, owing to the diseased state of the haulms, much contamination will occur.

Where the attack is prevalent but recent, the development of Blight in the *seed* tubers subsequent to digging may be greatly reduced by immersing them in formaldehyde. The treatment is simple and inexpensive. The apparatus (see Fig. 2) consists of:—

- (1) A low, wide wooden tub containing sufficient fungicide to allow complete immersion of the seed box full of tubers.
- (2) A piece of corrugated iron or other support, to form a draining table.
- (3) A wooden container with high sides and two handles, just large enough to hold a seed box. It prevents tubers falling from the seed box during immersion.
- (4) The fungicide recommended is a 1 per cent. solution of formaldehyde (1 pint of commercial, 40 per cent., formalin in 99 pints of water); 15 gal. are sufficient for hundreds of boxes.

The apparently sound seed is placed in the boxes when dug in the field, brought to the farm and treated the same day. As each box is unloaded it is placed in the wooden container, dipped once in the fungicide and transferred to the draining table to allow excess fungicide to run back into the tub. The box is then stacked in the usual way. With four men working (one unloading the boxes, two dipping and one stacking) 360 boxes of seed were treated in 1 hour. The formaldehyde is not injurious; dilutions up to 3 per cent. have been tested and the treated and untreated seed sprouted equally well.

CONTROL OF POTATO BLIGHT

During the past four years numerous tests have been made under field conditions. Details of two experiments are given in Table II, p. 1164. In 1935 and 1936 fifteen trials were carried out and the combined results were:—

				<i>No. of Tubers</i>	
				<i>Healthy</i>	<i>Diseased</i>
Dipped .. .. .	..	..	..	1,706	48
Undipped (Controls) ..	..	..	..	2,512	2,109

Dipping tubers from diseased crops intended for export is impracticable. Such crops should be thoroughly scorched to arrest further development of the attack and, in dry weather, an interval of at least one week should elapse before the tubers are dug, to reduce the risk of contamination from the soil at lifting time. In wet weather a still longer period is necessary. In one experiment foggy periods occurred frequently during the six-day interval between scorching and lifting the crop. The results are given in Table III and show that the tubers, which were apparently healthy when dug, developed much Blight in storage. The potatoes dipped in formaldehyde remained healthy, and this suggests that the undipped potatoes contracted the disease at digging time, and since the haulms were quite dead, the soil was probably the main source of infection.

TABLE III

				<i>No. of Tubers</i>	
<i>Treatment</i>				<i>Healthy</i>	<i>Diseased</i>
Dug 29.6.36 before scorching.	Undipped	..	232	404	
„ 4.7.36. Scorched 29.6.36.	„	..	480	130	
„ 4.7.36. „ 29.6.36.	Dipped	..	126	1	
„ 4.7.36. Not scorched.	Undipped	..	309	264	

The cutting of diseased haulms is not recommended, because scorching is preferable and because the fungus remains active on the cut haulms for several days in wet weather.

Where the disease has reached an advanced stage it is doubtful if much can be done to reduce the loss. Probably the best plan is to allow the disease to run its course and kill the haulms and to delay digging as long as possible.

In conclusion, the serious losses caused by Blight on the early potato crop in Jersey may be almost entirely eliminated by adopting the recommendations already outlined. In view of the high value of the sound crop, the expense entailed in carrying out the precautions is very small indeed. The treatment of diseased crops gives less satisfactory results; some loss is inevitable, but this can be reduced by the methods suggested in the second part of this article.

MARKETING NOTES

Milk Marketing Scheme. Pool prices and rates of producer-retailers' contributions for January, 1937, are given below, with comparative figures for December and January, 1936. The wholesale liquid milk price was 1s. 5d. per gal. in each month.

Region	Pool Prices			Producer-Retailers' Contribution		
	Jan.	Dec.	Jan.	Jan.	Dec.	Jan.
	1937	1936	1936	1937	1936	1936
	d.	d.	d.	d.	d.	d.
Northern	14	14	13½	2½	2½	3½
North-Western	14	14	13½	2½	2½	3½
Eastern	14½	14½	13½	2½	2½	3½
East Midland	14½	14½	13½	2½	2½	3½
West Midland	13½	14	13½	2½	2½	3½
North Wales	13½	14	13½	2½	2½	3½
South Wales	14	14	13½	2½	2½	3½
Southern	14½	14½	13½	2½	2½	3½
Mid-Western	14	14	13½	2½	2½	3½
Far-Western	13½	13½	13	2½	2½	3½
South-Eastern	14½	14½	14	2½	2½	3½
Unweighted Average ..	14·05	14·14	13·43	2·59	2·52	3·18

These prices are exclusive of any premiums for special services and level deliveries, and also of the Accredited producers' premium of 1d. per gal.

The sum required for the payment of the accredited premium was equivalent to a levy of 350d. per gal. on pool sales.

The inter-regional compensation levy was fixed at 1½d. per gal., compared with 2d. per gal. in January, 1936. A levy of ¼d. per gal. was made for general expenses.

Sales on wholesale contracts were as follows:—

	Jan., 1937 (estimated)	Jan., 1936
	Gal.	Gal.
Liquid	48,145,121	46,400,975
Manufacturing	16,006,196	21,106,120
	<hr/> 64,151,317	<hr/> 67,507,095
Percentage liquid sales	75·05	68·73
Percentage manufacturing sales	24·95	31·27

The average realization price of manufacturing milk during January was 6·25d. per gal., compared with 6·02d. per gal. for January, 1936. The quantity of milk manufactured into cheese on farms was 351,617 gal., compared with 428,146 gal. in the previous month and 355,384 gal. in January, 1936.

MARKETING NOTES

Milk Products Marketing Scheme. The public inquiry into objections to this scheme ended on January 29 after a hearing lasting 16 days in all, 14 in London and 2 in Edinburgh.

Pigs and Bacon Marketing Schemes : *Conditions of Sale of Pigs to Curers.* The Pigs Marketing Board have made a determination relating to the sale of pigs by registered producers to registered bacon curers, to operate from February 15 until further notice. The determination applies to every agreement made by a registered producer with a registered curer for the sale of pigs having a dead-weight of from 7 score to 10 score 10 lb. and intended to be used for the production of bacon. The price to be paid is left to be agreed between producer and curer, but every agreement must fix the price per score dead-weight according to the class of the pig, and must also provide that every pig sold under it shall be classed according to dead-weight and graded after slaughter according to measurements and conditions similar to those provided for under the 1937 contract which was declared void. The agreed price is to be subject to an addition or deduction for a pig other than a Grade B pig on the same scale as was prescribed by the Board for the 1937 contract.

Provision must be made in every agreement for sale for the deduction and retention by the curer of 6d. per pig from the agreed price towards his expenses in insuring against or covering any loss through damage to pigs during transit or by disease. A further deduction of 6d. per pig is to be remitted to the Pigs Marketing Board by or on behalf of the producer in respect of services rendered to the producer by the Board. The curer must also agree to supply the producer and the Pigs Marketing Board with a grading ticket showing the class, weight, grade, and price of each pig, and to permit any person appointed by the Board to have access to his premises for the purpose of noting and checking the weighing, classification, and grading of the pigs.

Potato Marketing Scheme : *Census of Potato Stocks.* All registered producers and authorized merchants have been requested to furnish returns to the Potato Marketing Board showing the stocks of potatoes on hand on the night of February 13.

List of Authorized Merchants. The revised list for 1937 has been issued to all registered producers.

MARKETING NOTES

Hops Marketing Scheme. Final figures relating to the 1935 hop crop show that total sales by the Hops Marketing Board amounted to 224,026 cwt. and receipts to £2,025,000, including a payment from the Levy Fund to make up the agreed average price of £9 per cwt. on the estimated demand of 225,000 cwt. Hops of the 1935 crop remaining on hand are to be disposed of for uses other than brewing.

Milk Acts, 1934 and 1936 : *Manufacturing Milk.* Advances made by the Ministry up to February 15, 1937, in respect of manufacturing milk were as follows :—

Section of Act		Period of Manufacture	Quantity	Advances
	<i>(a) Milk Marketing Board for England and Wales.</i>			
	In respect of milk :		Gallons	£
1	Manufactured at factories other than the Board's	April, 1934, to November, 1936	488,540,963	2,142,473
2	Manufactured by the Board ..	April, 1934, to Sept., 1935	2,573,662	12,850
3	Made into cheese on farms ..	April, 1934, to June, 1936	36,055,516	187,463
	* Total for England and Wales ..		527,170,141	2,342,786
	<i>(b) Government of Northern Ireland.</i>			
	In respect of milk :			
6	Manufactured into cream and butter at registered creameries ..	April, 1934, to Sept., 1936	60,168,430	359,021
	TOTAL ..		587,338,571	2,701,807

* Owing to the Cheese-Milk Prices for August and September, 1936, being in excess of the Standard Price, no subsidy is payable in respect of milk produced and manufactured in these months.

Cheese-Milk Price. For the purpose of payments under the Milk Acts, 1934 and 1936 (whether by the Exchequer to Milk Marketing Boards or by Boards to the Exchequer) in respect of milk used for manufacture, the cheese-milk price has been certified by the Minister and the Secretary of State for Scotland to be 5·01 pence per lb. for the month of February, 1937.

Wheat Act, 1932 : *Sales of Home-grown Wheat, Cereal Year, 1936-37.* Certificates lodged with the Wheat Com-

MARKETING NOTES

mission by registered growers during the period August 1, 1936, to February 5, 1937, cover sales of 13,710,534 cwt. of millable wheat as compared with 21,532,591 cwt. in the corresponding period (to February 7) in the last cereal year.

Anticipated Supply of Millable Wheat. The Minister, on the recommendation of the Wheat Commission, has made, under Section 2 of the Wheat Act, the Wheat (Anticipated Supply) No. 1 Order, 1937. This Order varies the Wheat (Anticipated Supply) No. 2 Order, 1936, by substituting 25,750,000 cwt. for 26,000,000 cwt. as the quantity of home-grown millable wheat of their own growing that it is anticipated will be sold by registered growers during the cereal year 1936-37.

New Quota Payments Order. The Minister, in pursuance of the powers conferred upon him by the Wheat Act, 1932, and on the recommendation of the Wheat Commission, has made the Wheat (Quota Payments) No. 1 Order, 1937, prescribing that the amount of the quota payment, which every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of deliveries of flour during the period commencing January 27, 1937, shall be 2·4 pence per cwt. (equivalent to 6d. per sack of 280 lb.). This Order supersedes the Wheat (Quota Payments) No. 3 Order, 1936, under which the quota payment has been 4·8 pence per cwt. (1s. per sack of 280 lb.) since November 1, 1936. The new rate is again the lowest since the Wheat Act came into force.

Sugar Industry (Reorganization) Act, 1936 : *Production of Home-Grown Beet Sugar during the 1936-37 Campaign.* According to information furnished to the Ministry by the British Sugar Corporation, Ltd., the total quantities of beet sugar manufactured in Great Britain during January, 1937, and the corresponding month in 1936, were :—

	White cwt.	Raw cwt.	Total cwt.
1937	672,406	806,843	1,479,249
1936	351,980	516,140	868,120

The total quantities of sugar produced to the end of January in each of the two manufacturing campaigns were :—

	White cwt.	Raw cwt.	Total cwt.
' Campaign 1936-37 ..	5,319,609	5,365,716	10,685,325
" 1935-36 ..	4,339,975	5,405,962	9,745,937

MARKETING NOTES

1936-37 Campaign. Provisional results of the present campaign are now available and are shown below in comparison with the final figures for the 1935-36 campaign:—

	1936-37 (Provisional)	1935-36
Acreage	354,909	374,147
Beet tonnage	3,448,000	3,403,989
Yield per acre (tons)	9.7	9.1
Sugar content (%)	17.3	16.4
Sugar production (tons)	537,000	487,325

Live Stock Industry Bill. The debate on the Second Reading of the Bill in the House of Commons took place on January 21 and 22. The Bill was read a second time, and proceedings in Standing Committee commenced on February 2. The Financial Resolution was agreed to on January 25.

Cattle Fund. The following table gives particulars of payments made under the Cattle Industry (Emergency Provisions) Acts, 1934 to 1936, and shows the numbers of animals marked on importation into Great Britain:—

	April 1, 1936, to Jan. 31, 1937	April 1, 1935, to Jan. 31, 1936	*Sept. 1, 1934, to Jan. 31, 1937
Payments	£3,298,590	£3,161,338	£9,195,947
Animals in respect of which payments were made	1,405,268	1,334,159	3,882,316
Average payment per animal	£2 6 11	£2 7 5	£2 7 4½
Imported animals marked at Ports (Great Britain only)	482,401 (up to Jan. 30)	381,333 (up to Jan. 30)	1,234,815† (up to Jan. 30)

* Commencement of subsidy payments.

† As from August 6, 1934.

The International Beef Conference and Empire Beef Council. In the course of the statement he made in the House of Commons on July 6, 1936, outlining the Government's long-term policy for the live stock industry, Mr. Elliot said:—

“ It is the Government's desire that, at the earliest possible date, the responsibility for securing stable market conditions should be assumed by producers in the various countries concerned and exercised in the light of joint discussion of the problems involved.

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"This discussion would be secured by the institution of an Empire Meat Council, representative of the United Kingdom and other Empire countries concerned, and an International Meat Conference, representative of the United Kingdom, other Empire countries and the foreign countries supplying substantial quantities of meat to this market."

The International Conference and the Empire Council will be concerned, in the first instance at any rate, only with imports of beef to the United Kingdom. Discussions concerning the constitution and functions of the International Beef Conference and the Empire Beef Council have now reached an advanced stage, and informal meetings of both bodies have already been held.

Producers in the United Kingdom, acting through the National Farmers' Unions for England and Wales, Scotland and Northern Ireland, have nominated Lord Bingley as their representative, and, on January 29, the Minister of Agriculture and Fisheries announced in the House of Commons that Lord Bingley had consented to his nomination. Lord Bingley was Chairman of the Reorganization Commissions for Pigs and Pig Products and for Fat Stock.

Bacon Supplies in 1936. The following table shows the supplies of bacon (including salted pork and tinned hams) that were available from all sources for consumption in the United Kingdom in each month of 1936:—

Month 1936	Great Britain Output			Northern Ireland Output	Net Imports†	Total supply of bacon to U.K. Market
	From home pigs	From im- ported pigs and carcasses*	Total			
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Jan. ..	184,100	27,100	211,200	57,500	565,600	834,300
Feb. ..	169,400	34,700	204,100	50,000	548,200	802,300
Mar. ..	184,600	43,400	228,000	54,300	606,100	888,400
April ..	201,400	39,900	241,400	56,900	588,700	887,000
May ..	195,000	43,500	238,500	56,300	592,600	887,400
June ..	173,000	43,500	216,500	59,400	614,300	890,200
July ..	188,500	44,100	232,600	57,800	651,800	942,200
Aug. ..	198,800	44,000	242,800	52,300	647,000	942,100
Sept. ..	223,700	29,900	253,500	66,900	538,400	858,800
Oct. ..	236,100	29,600	265,600	77,400	562,800	905,800
Nov. ..	200,700	22,500	223,300	72,600	602,800	898,700
Dec. ..	162,000	25,100	187,100	63,800	643,100	894,000
TOTAL	2,317,300	427,300	2,744,600	725,200	7,161,400	10,631,200

* Including Northern Ireland pigs shipped to Great Britain.

† Imports minus re-exports.

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Total supplies (exclusive of the output of the small unregistered curers) amounted to 10,631,200 cwt., compared with 10,548,400 cwt. in 1935.

Bacon Import Arrangements for 1937. In the January, 1937, issue of this JOURNAL (p. 950) it was stated that the foreign quota for the first 6 weeks of 1937 had been fixed at a rate approximately 10 per cent. higher than that for the first 4 months of 1936. It has been decided to continue the foreign quota at this rate to the end of March, 1937. The allocations to the individual foreign exporting countries for the period February 12 to March 31, are as follows:—

<i>Country</i>	<i>Allocations Cwt. (a)</i>
Denmark	447,442
Netherlands	66,940
Poland	56,018
Sweden	33,118
Lithuania	20,787
Estonia	5,285
Finland	2,819
Latvia	4,932
U.S.S.R.	5,932
Argentina	4,932
U.S.A.	56,370
Allowance for imports from foreign countries not scheduled to the Bacon (Import Regula- tion) Order	17,049
TOTAL	721,681

(a) Subject to amendment, as regards certain individual countries, in respect of overshypments or undershipments in previous periods.

After March 31, 1937, imports of bacon and hams from foreign sources will be regulated from time to time in the light of recommendations made by the Market Supply Committee, who will be assisted by a Bacon Supplies Consultative Committee representative of all the interests concerned.

Regulation of Imports of Processed Milks. Imports of processed milks during the year 1936, together with the allocations made to foreign exporting countries and the Irish Free State, and imports from other Empire countries in the two previous years, are shown in the table on page 1176.

Imports from the main foreign sources of supply to the end of July, 1937, are governed by an arrangement that

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Source	Condensed Skimmed Milk	Condensed Whole Milk	Milk Powder	Cream
	Cwt.	Cwt.	Cwt.	Cwt.
Foreign Countries—				
Allocations	1,217,400	253,200	77,500	34,100
Imports	1,281,300	205,500	68,000	34,600
Irish Free State—				
Allocations	84,000	21,600	220	37,000
Imports	82,000	18,400	270	41,800
Other Empire Countries—				
Imports, 1934	—	119,900	172,700	—
Imports, 1935	—	128,800	172,200	—
Imports, 1936	—	97,600	173,300	200

provides for the following percentage reductions calculated on the quantities imported in the corresponding period of the twelve months, June, 1932, to May, 1933: For condensed whole milk and milk powder, 50 per cent.; for condensed skimmed milk, 45 per cent., rising to 60 per cent. from the beginning of April, 1937.

These quantitative arrangements are supplemented by agreements between the various manufacturing interests concerning minimum selling prices in the United Kingdom market. In addition, the Netherlands authorities have taken steps to overhaul the machinery for marketing Dutch condensed skimmed milk in this country.

National Mark Scheme for Derby Cheese. The Ministry's proposed scheme for applying the National Mark to Derby Cheese was adopted at a meeting of Derby Cheesemakers, arranged by the Derby Cheesemakers' Association on January 20 this year. The meeting also elected the National Mark Derby Cheese Grading Committee to appoint a grader for the purposes of the scheme, and to supervise the grading arrangements subject to the overriding supervision of the Ministry.

One standard grade only has been set up in connexion with the scheme. The definitions of quality of this grade, which is designated "Selected" Derby Cheese, are laid down in the Agricultural Produce (Grading and Marking) (Derby Cheese) Regulations, 1937.* The regulations came into force on

* S.R. and O., 1937, No. 122 (Obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London W.C.2. Price 1d., post free 1½d.)

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February 8, 1937. Copies of Marketing Leaflet No. 88, explaining the scheme, may be obtained free of charge on application to the Ministry.

National Mark Eggs in 1936. The National Mark scheme for eggs, now entering upon its ninth year of operation, still maintains its position as one of the most important of the National Mark schemes. The total output of authorized packing stations for 1936 was 516 million eggs, of which 81 per cent. were packed under National Mark labels. The number of packing stations operating under the scheme in 1936 was 195—an increase of 3 during the year.

The following table shows the classification of authorized packing stations in relation to their total output during the last 3 years:—

Output	No. of Stations		
	1934	1935	1936
Over 10 million eggs	5	5	3
Over 5 and up to 10 million eggs ..	23	27	22
Over 2 and up to 5 million eggs ..	51	56	64
Up to 2 million eggs	106	104	106

National Mark Scheme for Cabbage Greens and Cabbages. The Minister has given notice of his intention to make amending regulations under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, which will have the effect of varying, during the months of March and April in each year, the minimum weight prescribed in the case of the grade designation “Selected Hearted” in Schedule I of the principal regulations (S.R. & O. 1934, No. 204).

Copies of the draft regulations may be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller, price 1d. each, post free 1½d.

National Mark Publicity. National Mark “Weeks” will be held in Ipswich (March 10-20) and in Lincoln (April 7-17), 1937.

The principal features of these campaigns will be National Mark exhibitions staged by the Ministry; shop-window display and poster ballot competitions; cinema lectures for housewives and school children; and special cooking demonstrations and competitions for residents of these towns and the surrounding districts.

MARCH ON THE FARM

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Cultivations. Up to the time of writing, the weather during the past winter has been unfavourable for getting the soil into good condition for the March seed beds, there having been much rain, but little or no frost. The kind of tilth produced by spring cultivations is controlled much more by the weather in the preceding months than by the intensity of treatment at this time of the year. One of the characteristic effects of a tilth produced after a spell of frost is the quick get-away that it enables the crop to make. A good, quick start makes itself felt throughout the life of a crop; the experiences of growers, and the observations of the scientist when correlating the state of a crop at various stages of growth with the yield, show the importance of this. Illustrations of this can be readily recalled; a difference of a few hours in the times of sowing swedes, or an accidental difference in the depth of sowing from a drill coulter often causes a portion of the crop to establish a lead in the first month, and this superiority is maintained until the crop is mature. One of the interesting conclusions reached, as a result of the recent experiments on cultivations at Rothamsted and Cambridge, is that many of the ordinary cultivations are of no value. Work on soil moisture at Rothamsted has convinced the experimenters that water does not move to any important extent in the soil by capillarity, and that it is consequently useless to attempt to control the movement of moisture in the soil by harrowing and rolling; once the soil has been got into the crumb-structure state, further operations are considered to have no value, except to pack the soil closer to the seed, or to destroy weeds.

As regards the autumn-sown crops, beans are, if possible, hoed this month, and wheat may be harrowed, rolled and top dressed; after such an open late autumn and wet, early winter, an early application of nitrogen is recommended. The rolling is particularly useful on the lighter soils; the benefits of sheeping wheat may arise, on the lighter soils, as much from the consolidation as from eating off the crop. A discussion arose two years ago over sheeping a 100-acre field

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of wheat on a mechanized farm near Oxford. There was, owing to the large size of the field, an interval of more than a fortnight between the time the folding was commenced and finished. It was argued that the crop would ripen earlier where it was first folded, and that this would cause inconvenience when "combining"; a letter was written to the grower at harvest time, asking if there was much difference in the ripening of the wheat. In reply, it was stated that practically no difference could be detected.

Grass and Clover Seeds. The seeds mixture allows great scope for custom and opinion regarding both the total quantity to be sown and the constituents. It may surprise some to know that, on extensive areas of non-agricultural land, 100 lb., and even 200 lb., of seeds are sown to the acre; in Kent, the county authorities use the latter amount when seeding sports grounds, having been convinced by experience that it is essential in order to establish rapidly a good turf. Farmers in the Romney Marsh use 70-100 lb. of seed to the acre, which is twice the usual rate.

Proper consolidation of the soil is very important in securing a good "take" of grass and clover seeds, and the effect is particularly marked in regard to red clover. At the Bangor College Farm, it has repeatedly been noticed that red clover completely fails to establish itself on a turf ploughed up and resown with either rape or oats the same year. At first, this was attributed to possible sourness or lack of some manurial ingredient in the freshly-ploughed turfy soil, but in a trial last year, no improvement was effected by applications of lime, slag and kainit, whether alone or in different combinations. Hardly a plant of red clover can be found in ten acres, although grasses and wild white clover have established themselves well. A colleague observes that this need of red clover for a well-consolidated seed bed can be noticed in any field of maiden seeds if moles are present. No healthy plants of red clover will be found over or near a mole run.

The constituents of the mixture vary with the length of the ley, soil, etc.; the more permanent species figure largely in the longer leys. Again, in long leys, the proportion of indigenous grasses should be increased, though these should not eliminate the commercial strains that have the advantage of starting growth very early in spring; an extended pasture period may be obtained by including indigenous strains to the extent of about one-third of the mixture. With regard

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to soils, clover does not thrive in the absence of lime; this explains why it often fails on light soils. Acid soils are not favourable to perennial ryegrass, the plants tending to be small, with little reserve strength to meet adverse conditions, such as frost or drought. Pests such as clover sickness and frit-fly may influence the choice of constituents; ryegrass encourages frit-fly in wheat when the ley is ploughed, and its amount should be reduced for short leys if loss from this source is feared.

Early Bite and Catch Crops. The possibility of providing an early bite by applying nitrogenous manures to grass land in February or early March was much discussed a few years ago, and raised false hopes for many farmers. In some years, the method proved successful, but, most frequently, the application did no more than improve the colour of the grass. The explanation of the variable results is provided by research at Jealott's Hill (Page, 3rd Internat. Grass Land Conference, 1934). When the temperature at a depth of 4 in. is 42° F. or below, there is very little growth, nitrogen or no nitrogen. When the temperature rises above 42° F. growth commences, but until 48° F. is reached it is at a low rate owing to the slowness of those soil biological processes that liberate nitrogen. If, however, the soil is rich, or nitrogenous manures have been applied, these biological processes are accelerated, and more growth takes place in the interval between 42° and 48° F. The greatest effect from applying nitrogenous manures for an early bite is thus in those years when the soil remains for a long time in the critical zone, between 42° and 48° F., as in 1930. In 1934, for instance, it took only three days at Jealott's Hill to pass the critical zone, and the unmanured plots reached production only 2 or 3 days later than those that had received nitrogenous manuring, as against 12 days in 1930.

Other important factors in the provision of an early bite are the intensity of grazing in the previous autumn and winter, and the proportion of early species, such as perennial ryegrass, tall fescue and meadow foxtail. In temporary leys, Italian ryegrass is the most important constituent if extreme earliness is required. Very early bites are not always welcomed. On mountains, these tempt sheep to dangerous positions on rocks, and up to a generation ago it was quite a common practice on many Welsh hills to keep goats, so that

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they would get these early bites before the sheep; the goats were done away with for several reasons, such as their habit of eating off the bark of trees.

The provision of catch crops may often be more certain than an early bite of grass. Thus, rye, sown in August or September, following a silage crop, or second early potatoes, will provide for late March or early April; $1\frac{1}{2}$ cwt. nitrochalk to the acre, applied in February, will increase the crop. In the earlier parts, as in the south, crimson clover, sown immediately after harvest, will provide food in March. This year, additional green food of this kind will be doubly welcome. The best hay is usually reserved for this time of the year, but, this season, there has been little or no "best" hay.

Keep on Mountain Land. The lower mountain slopes are usually stocked with sheep throughout the winter, the ewes remaining there until they may be brought down for lambing in April. To ensure sufficient keep over winter, these enclosed portions of mountain or moorland are not grazed during the summer. *Nardus*, *Molinia*, sheep's fescue, bracken and *Calluna* are the predominant species on such land; there is a lack of legumes in such grazings. The inferior *molinia* type of pasture can be converted to the *Agrostis*-fescue type by increasing the fertility, when superior winter grazing is thus provided. Some moorland plants and herbs play an important rôle at this time of the year. Fagan and Watkins (*Welsh Jour. of Agric.*, VIII, 1932) and Brynmor Thomas (*Agric. Progress*, XII, 1935) have interesting observations on the value of such plants in mountain grazings. Ling and bilberry are amongst the most common herbs eaten by stock in such pastures, the topmost shoots being eaten. In many places, ling is the mainstay of the Blackface. It is evergreen and easily reached in snow; Thomas states that it is only after an exceptionally hard winter that it is of little feeding value at this time of the year.

There is a certain amount of apparent conflict of interest between the agriculturist and the sportsman with regard to heather. Heather is improved by burning, which induces young, tender shoots, instead of the old woody stems; further, old heather is difficult for sheep to travel across. If, however, too much heather is burnt at once, the grouse may leave the moor—according to some, this plant forms 50 per

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cent. of the diet of the grouse. Men of experience consider that the interests of the flockmaster and of the sportsman in regard to ling are by no means incompatible, well regulated burning being best for both. Many farm leases contain provisions to control the burning of heather, ten- or even twenty-year burning rotations being stipulated. It will be recalled that the Agricultural Holdings Act, 1923, does not exempt from fines or penal rents infringements of regulations for the burning of heather. Cottongrass, or drawmoss, a sedge, flourishes only on the wetter type of moor, and provides keep in February and March, when the heather may be poor. It is prized by shepherds, who regard as valuable occasional patches of wet peat capable of carrying drawmoss; Thomas remarks that great care is taken to avoid overdraining such patches.

Lambs. Judging by two sets of statistics issued recently, the prospects for the fat lamb trade do not appear very bright if we look beyond the coming season. In the December live stock census for England and Wales, a slight increase is recorded in the number of ewes kept for breeding, and nearly a 50 per cent. increase in the number of ewe lambs intended for breeding, these rising from just under a million to nearly 1,400,000; most of the latter will not produce fat lambs until next year. Again, in the *New Zealand Journal of Agriculture* for December, 1936, the estimate of the current season's lambing in that country is put at 16,862,000, an increase of nearly 10 per cent. over last year's figure.

Easter lambs are well on, and will soon be marketed. The first consignments of Irish milk-fed lambs arrived well in time for Easter last year, being landed in Holyhead before the middle of March. The balance of limited supply and demand for lambs at this time may easily be upset if these importations are increased. To attain weights of 70-80 lb., the lambs should be dropped in December or January, and they as well as their mothers should be well fed. A large proportion of the lambs do not reach this weight but the high prices make it profitable to sell them at this stage.

The majority of grass flocks lamb in March, and it is an important month on farms where such flocks provide, with the cattle, the bulk of the revenue. A few extra lambs saved will soon repay extra labour, or extra shelter. On farms where little or no feeding is provided, additional to the grass,

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the flockmaster should consider seriously the merits of using the plough to provide kale or mangolds for the flock in March and April. If the ewes were encouraged to milk better, the lambs could be sold earlier, and the grass land would have a better chance of recovery from sheep staining and parasites before the next season.

March provides a good opportunity for selling off fat rams; if old sheep are saleable at any time, they are saleable in March and the first half of April. Ewes that have lost their lambs early, and that are not to be retained for breeding should, if possible, also be prepared for sale at this season.

Shearing sheep in March is not often heard of, except perhaps in connexion with the much repeated story of the stockbroker who, on a rising wool market, wired his farm bailiff to shear. Shearing at this time of year is, however, practised with sheep that are to be exhibited at shows during the summer, early shearing being particularly essential in those breeds having wool that ripens late. When sheep are shorn now, the fleece has time to develop in time for the show season. Some sheep societies fix a date before which the exhibits must not be shorn.

Store Cattle. The price of store cattle, which are bought in large numbers from now until the end of April, depends on the prospects for grass, as well as on fat cattle prices. It is hoped that, in the general interests of British agriculture, the position of the rearer of store cattle will improve, though it hardly seems possible. The position in cattle-rearing areas like Wales, and the poorer districts of the west of England and Scotland, is reflected, not only in the reduced receipts from store cattle, but also in the general level of farming. In such areas there is much marginal land, which quickly becomes rough grazing if neglected. On many farms in those areas, selling milk, instead of making butter and rearing calves, results in a proportion of the grass land being left for sheep, and not kept in cultivation.

Seed Treatment. Good cultivation and manuring may give disappointing results if precautions are not taken against seed-borne diseases. The pickling of seed corn has been simplified by the use of certain chemicals in powder form; solutions of copper-sulphate or of formalin, have the disadvantage that the grain requires drying before it is sown.

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The latter also has the disadvantage that it looks harmless, and, if one cannot resist the temptation to add a little extra "for luck," germination suffers. Half a pound sulphate of copper in enough water to moisten 4 bus. of grain, or one fluid oz. of commercial formalin to 2 gal. water, will give very efficient treatment.

Dry copper carbonate, mixed with grain at the rate of $\frac{1}{2}$ lb. per $2\frac{1}{2}$ cwt. of grain, has also been much used in recent years for disinfecting seed. Recently, however, organic mercurial compounds have come into general practice, and they are more potent than copper. These compounds, costing only about 1s. per acre, give almost complete control of certain seed-borne diseases, like Bunt in wheat, Leaf Stripe and Covered Smut of oats and barley, Loose Smut of oats, and Net Blotch of barley. If the fungus is within the grain, as in Loose Smuts of barley and wheat, pickling cannot give control, and one should not blame the material if such a disease appears. These seed disinfectants may be mixed with the grain on the barn floor, or in a special mixer; there are inexpensive models that give continuous operation, the seed and powder being let in at one end, and emerging well mixed at the opposite end. These mercury compounds are used as a matter of routine by many progressive farmers and seedsmen. The treatment is a cheap form of insurance against the diseases mentioned. It may be said, in addition, that there is distinct evidence that these compounds stimulate the seed, helping it to get a good start, the importance of which has been stressed in the opening paragraph of these notes.

[Note. The Ministry desires to express its cordial appreciation of the valued services of Mr. E. J. Roberts as the writer of these monthly notes "on the Farm" since April, 1935. With the present issue, Mr. Roberts relinquishes, at his own desire, the preparation of these articles, which, from the next (April) issue onwards, will be contributed by Dr. Robert W. Wheldon, Department of Agriculture, Armstrong College, Newcastle-upon-Tyne (University of Durham).]

NOTES ON MANURING

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Size of Potato Tubers. Experiments have shown that size of seed and distance between sets may affect both the total yield and the size of the tubers produced. In general, the proportion of tubers below ware size increases as the size of the seed planted is increased, whereas, beyond certain limits that vary with the size of seed, wider spacing leads to a decrease in total yield, but increases the percentage of ware in the crop.

It is frequently assumed that nitrogenous manures exert a considerable influence upon size of produce—more so than other types of fertilizer. Such an effect has been noted on several occasions, but is by no means universal. In some experiments potash has proved more effective than nitrogen in increasing the percentage of ware, whilst in others fertilizers have had little or no influence on tuber size.

In Vol. XXXV, No. 1, April, 1928, p. 36, of this JOURNAL, T. J. Shaw described experiments on potatoes in Devonshire in which striking responses to fertilizers were obtained, both as regards total yield of tubers and also percentage of ware. The effects of the heaviest dressings of nitrogen, potash and dung used in those experiments were as follows:—

Sulphate of Potash	Percentage of Ware.					
	With Dung			Without Dung		
	S/Ammonia			S/Ammonia		
0 cwt. 	0 cwt.	3 cwt.		0 cwt.	3 cwt.	
3 cwt. 	38·6	47·9		28·0	34·9	
	47·6	60·2		37·3	50·0	

It will be seen that, not only were potash and nitrogen effective in raising the percentage of ware, both in the presence and absence of dung, but that dung itself gave a substantial increase in the proportion of ware. It should be noted, however, that the percentage of ware was extremely

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low at this centre and hence there was considerable scope for improvement. Comparing plots receiving sulphate of ammonia, potash gave a larger increase in the absence of dung than in its presence, whilst sulphate of ammonia was more effective in the presence of potash than in its absence.

In a report of a further series of trials in the Norfolk Marshlands in the seasons 1931-33, G. H. Bates gave yield data for seven fertilizer experiments, including applications up to 16 cwt. of fertilizer mixture per acre, in which the proportion of ware to total produce varied from as low as 65 per cent. to as high as 95 per cent. The general effect of fertilizer on percentage ware, however, seems to have been relatively small, and even the heavy applications, which included 4 cwt. per acre of sulphate of ammonia, failed to produce any very striking results. The mean increase or decrease in percentage ware given by each of the fertilizers, over plots not receiving that fertilizer, was as follows:—

*Superphosphate (35 per cent.)	4 cwt. per acre	..	+ 0.75 per cent.
„ (35 „)	6 „ „	..	+ 0.57 „
„ (35 „)	8 „ „	..	— 0.17 „
*Muriate of Potash	2 „ „	..	+ 1.25 „
„ „	4 „ „	..	+ 2.2 „
*Sulphate of Ammonia	2 „ „	..	+ 2.67 „
„ „	4 „ „	..	+ 3.82 „
†Artificial scuffed into bottom of ridge as compared with artificials broadcast	.. .. .	..	+ 1.43 „

* Average of 4 experiments. † Average of 3 experiments.

Though increases up to 6 per cent. were obtained in one or two experiments, none of the fertilizers produced a very striking effect on the percentage of ware, despite the fact that nitrogen and phosphate gave significant increases in yield at all four centres, and potash at two centres. Neither did the position of the fertilizer in the soil exert any considerable effect on this proportion, in the three experiments where this point was tested. The effect of superphosphate is particularly small in view of the fact that the yield of the crop was substantially increased by this fertilizer.

Further information as to the influence of manurial treatment on proportion of ware is given in the Rothamsted Report for 1935, from which the following data have been abstracted. The riddle size used in the separation of ware tubers from the seed and chats in these experiments was generally $1\frac{1}{2}$ to $1\frac{3}{4}$ inches.

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MEAN INCREASE OR DECREASE IN PERCENTAGE OF WARE

<i>Manurial Treatment</i>	<i>Centres where significant effect on yield was obtained</i>	<i>Other Centres</i>
Superphosphate $3\frac{1}{2}$ cwt. per acre ..	+ 0.81 (7)	- 1.16 (12)
Sulphate or muriate of potash 2 cwt. per acre	+ 10.46 (7)	+ 0.82 (8)
Sulphate of ammonia 3 cwt. per acre	+ 1.65 (20)	- 0.36 (10)
Dung (seasons 1932 and 1934) ..	+ 0.85 (2)	—
Dung (season 1935)	+ 17.15 (2)	—

(The figures in brackets show the number of centres over which the means are taken.)

Here again, as in the Norfolk trials, superphosphate and sulphate of ammonia in moderate amounts produced very little effect. Potash also had little influence on the proportion of ware at the centres that showed no response to potash in the actual yield of crop, possibly because the percentage of ware was usually already high. At centres where potash increased the crop, however, it also produced a very striking increase in the percentage of ware, as in the Devonshire experiments. The difference between the results relating to dung is probably due to the fact that in the 1933 and 1934 trials the mean percentage of ware was approximately 90 per cent., and little further increase was possible, whereas in the 1935 trials it was only just over 70 per cent.

The evidence from the three sets of figures seems to suggest that, in general, superphosphate exerts very little influence on the percentage of ware, whilst sulphate of ammonia in moderate amounts usually has a slightly greater effect than superphosphate, and occasionally, as in the Devonshire trials, may give a very striking result. Potash, on the other hand, seems to have been more generally successful in bringing about a substantial increase in the proportion of tubers of ware size, and was usually effective under circumstances in which potash increased the yield of the crop as a whole. That dung should produce such a marked effect in three out of five experiments is interesting, and serves to emphasize both the importance of dung to the potato crop and that, where only a light dressing of dung is available, special care should be taken to ensure a good supply of potash, as well as nitrogen, in the artificial fertilizer mixture.

Climatic conditions will always exert a considerable influence on both yield and size of tubers, but the grower who is frequently troubled with a high proportion of tubers below

NOTES ON MANURING

ware size, might obtain some improvement by reconsidering both the size and spacing of the sets and also the "balance" of his manuring.

Fertilizers for Sugar-Beet. The response, or lack of response, by this crop to artificial fertilizers has created much controversy, and, in some quarters, considerable disappointment. Experiments in which sugar-beet has shown a response to treatment with fertilizers are not entirely lacking, however, and there is no shortage of instances in which attempts to grow sugar-beet on land in poor condition, with little or no manuring, have definitely failed. Nevertheless, experience suggests that soil conditions, tilth, careful hoeing, and, in general, the efficient execution of all work at the time when the crop is just at the right stage to benefit by it, all exert an overwhelming influence on the final yield, far more so than with many other crops. That artificial fertilizers will be largely wasted if cultivations are not performed efficiently and at the right time is probably true of most crops, but it is an absolute certainty with the sugar-beet crop. Again, the influence of climatic conditions on yield is very great. No amount of fertilizer can produce the large effects on yield, on land in reasonably good heart, that season alone may induce. Many growers have had experience of this in the past two seasons, but the effects of season and cultivation do not constitute reasonable grounds for the neglect of adequate manuring.

Most people agree that, on the average of a period of years, sugar-beet will give a profitable response to nitrogenous fertilizer up to about 3 cwt. per acre. This was the result obtained in nine years' trials at Sprowston. From other trials at the same centre there is some evidence that, on the basis of equal quantities of nitrogen, nitrate of soda is slightly more efficient than sulphate of ammonia and, in general, especially on light soils likely to respond to potash, one cwt. of either of these two fertilizers can be regarded as about equal in value for sugar-beet, despite the slightly higher nitrogen content of the sulphate of ammonia.

The position with regard to phosphate and potash is not so clear, however, for many experiments have failed to show any significant effect on yield from the use of fertilizers supplying either of these two plant foods. Nevertheless, sugar-beet seedlings grow away better, and come to the hoe

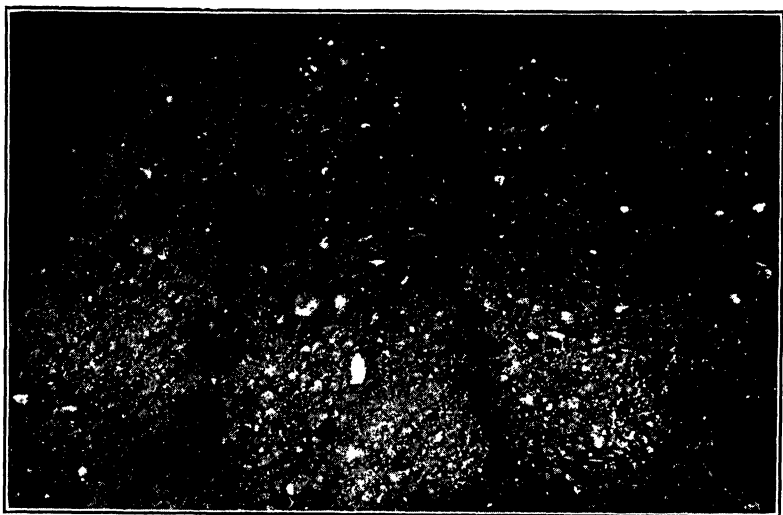
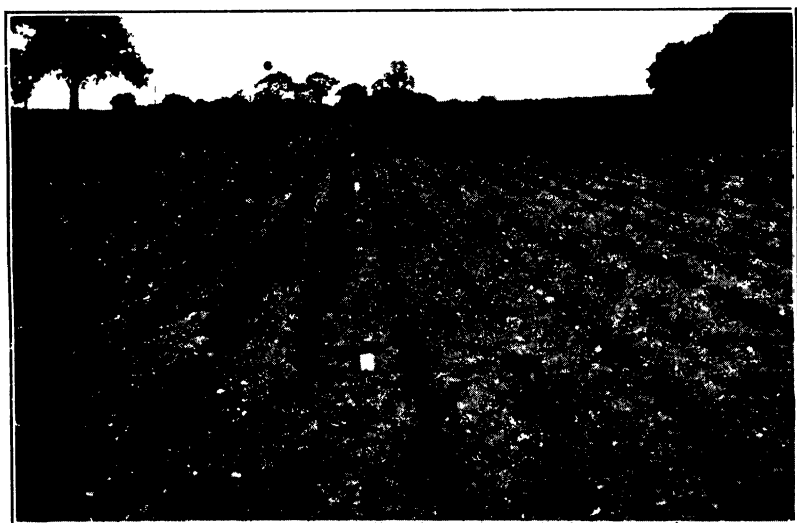


FIG. 1 Effect of phosphate on growth of sugar-beet seedlings. The plot on the left side of the photo received 6 cwt. per acre of superphosphate, and that on the right received no phosphate.



Photos : F. Hanley.

FIG. 2.—Effect of phosphate on early growth of sugar-beet on soil in a normal state of fertility. As often happens in these circumstances, the effect became less obvious as the season advanced (photo taken at Sprowston, Norfolk, June 19, 1936. Right of first peg received 6 cwt. of superphosphate per acre ; left of first peg received no superphosphate).



Photos : F. Hanley.

FIGS. 3 (*above*) and 4.— Effect of superphosphate on growth of sugar-beet on soil low in phosphate. The effect became more pronounced as the season advanced. Photograph taken in East Norfolk, showing the same plots on two different dates. No. 3 on June 8, and No. 4 on June 19, 1936. Of the plots in the foreground, the left received 6 cwt. per acre of superphosphate and the right received no phosphate.

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more quickly and more uniformly, in the presence of a moderate dressing of phosphatic fertilizer, and, though this may not always result in a bigger crop, there are years and circumstances in which such an improved growth in the early stages is welcome. For instance, it may enable the crop to grow more quickly through the stage when it is most vulnerable to attack by some insect pest or fungoid disease, leaving a moderately full plant despite the presence of the pest. Again, early brairding enables hoeing to begin early and thereby facilitates the control of weeds. The very serious results that follow definite phosphate deficiency make it worth while to supply some phosphate if there is any doubt at all about the adequacy of the phosphate residues in the soil.

If a grower has used phosphates fairly liberally in recent years he will probably require to use no more than 2-3 cwt. per acre of superphosphate for the sugar-beet crop. Even on land that has been well done in the past, however, this small quantity seems to give a slight impetus to the young seedling—an effect that can often be seen at brairding. There are circumstances, however, in which more than the equivalent of 2 cwt. per acre of superphosphate is desirable, for example: (1) in districts where it is the practice to apply to the root crop sufficient phosphatic fertilizer for the whole rotation; (2) where deep ploughing is being practised for the first time; and (3) where economy in the use of artificial fertilizers during past years has brought about a serious reduction in the phosphate reserves in the soil. When looking at the financial side of the problem it must be remembered that, if the application of phosphate for the root crop is cut down, an additional application may have to be made somewhere else in the rotation for the other crops. Admittedly there seems little point in giving heavy dressings of phosphate to the sugar-beet crop if they are really intended for some subsequent crop, for even if there is little loss by leaching, the phosphate may be converted into some complex form in the soil, and become less readily available and therefore less effective, for the later crop for which it is intended. If, however, the phosphatic dressing for the sugar-beet crop is reduced, it is essential that steps be taken to ensure that subsequent crops do not suffer in consequence.

The response obtained from applications of potassic fertilizer has been relatively disappointing in so far as actual effect on yield of beet is concerned. There does, however,

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seem to be a definite connexion between nitrogen and potash—a connexion that is becoming more firmly established as additional experimental results become available, particularly in relation to the sugar content of the beet. There seems no doubt that, on many soils, especially sands and chalks, some potash should be included in the sugar-beet manure, and though the quantity may vary with soil type, an application of 2-3 cwt. per acre of 30 per cent. potash salts, or an equal amount of potash in some other form, is likely to prove worth while.

A growing tendency to sow fertilizer and seed together, using only one drill, has little experimental evidence to commend it for the sugar-beet crop at present. Where seed and fertilizer are sown down the same coulter there is risk of delayed germination, especially under any but moist seed-bed conditions. The risk is increased if potash salts, muriate of potash or kainit be included in the manure mixture. There is less risk, however, when a proper seed and manure drill is used, especially where the seed and fertilizer are delivered down separate coulters, the fertilizer being deposited rather deeper than the seed and separated to some extent from direct contact with it. Small dressings of certain fertilizers distributed with this type of drill are often held to be beneficial to seedling growth, e.g., about 2 cwt. per acre of bone superphosphate is often used in this way by fenland growers, though fenland seed-beds, needless to say, are usually well supplied with moisture. It may be that small quantities of certain fertilizers will prove beneficial when placed near the seed, but the practice involves some risk, varying with the type of fertilizer, the quantity used and the soil conditions at the time. More definite information is required on these points.

NOTES ON FEEDING

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THE current issue of the *Journal of Agricultural Science* is largely devoted to reports on experimental work dealing with practical nutrition problems, the main features of which are summarized below.

Grass Silage. Two lengthy communications by Dr. S. J. Watson and Mr. W. S. Ferguson, of the research staff of Imperial Chemical Industries, Ltd., embody the results of a very large volume of experimental work dealing with the losses of nutritive material involved in the ensilage of grass by various processes, and with the chemical composition of the different products.

The control of the ensilage process depends upon the compaction of the material and exclusion of air to as great a degree as possible, and the rapid acidification of the mass through the production of lactic acid. When the material is relatively loosely packed the enclosed volume of air is large, fermentation is vigorous, the temperature rises to 120° F. or more, and the loss, particularly of carbohydrates, is high. Better compaction, as secured by chaffing the material and packing it tightly by heavy trampling or other pressure devices, makes it possible to keep down the maximum temperature, with consequent reduced losses and a better product.

With materials, such as young grass, that are comparatively rich in protein, and consequently not rich in fermentable carbohydrates, it is not always possible to get a sufficiently rapid formation of lactic acid, and, therefore, either the lactic fermentation must be stimulated by an addition of fermentable carbohydrates, or the desirable degree of acidity must be secured by appropriate additions of acid. The latter method is that adopted in the now familiar A.I.V. process in which the material is watered with a dilute solution of mineral acids during the process of filling. For the purpose of the alternative type of method molasses forms a useful source of carbohydrate that can be conveniently distributed through the mass of ensiled material. Whey has also been used for this purpose, but only with success when applied in relatively concentrated form.

The data reported by the Jealott's Hill workers came from

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258 samples of ensiled grassland herbage, of which 65 samples were produced by the ordinary method without additions, 38 with added molasses, 4 with added whey, and 143 by the A.I.V. process. Data on a few silages made from other materials are also included in the report. The chemical nature of the products was examined in considerable detail, but we can only touch here upon some of the observations that are of direct practical interest.

The external characteristics of the silages varied with the acidity of the material, the more acid samples retaining to some extent the green colour of the grass and giving off only a faintly acid smell, whilst at the other extreme the silages of low acidity were dark brown in colour and strong smelling. The molassed silage is very favourably reported on as having at all acidities the characteristic sweet odour of the molasses, without any tinge of butyric acid. The smell of the A.I.V. silage was more variable, being quite pleasant at the higher acidities, but increasingly like that of ordinary silage as the acidity fell. The general conclusion is drawn, however, that ensilage of grass by the A.I.V. process "results in the production of a foodstuff of excellent quality, in which the breakdown of protein and the formation of organic acids, which is so characteristic of ordinary silage, is markedly reduced, though not to the extent which might be expected."

A much less favourable conclusion is drawn as to the merits of the ordinary process of ensilage, especially for the younger types of grass material in which the crude-protein content is relatively high.

The highest commendation is given to the molasses process, in which 15-25 lb. of molasses, suitably diluted with water, was used per ton of fresh grass. Whilst superior in general attractiveness this type of silage was "little inferior in its chemical characteristics to that produced by the A.I.V. process." The chief disadvantage is apparently that the breakdown of protein is rather greater than that obtaining with the A.I.V. process. The use of molasses is nevertheless recommended where silage of high-protein content is made. Considerable stress is placed upon the exercise of the greatest care in trampling the fodder, teasing it out, and allowing time in filling for individual layers, particularly in the bottom of the silo, to warm up to about 80° F. "No process that can be devised will be of any value where such precautions are not exercised."

NOTES ON FEEDING

The study of the losses of nutrients incurred in the conversion of grass into silage by the different processes led to the conclusion that, whilst some reduction of loss is effected by the molasses and A.I.V. treatments as compared with the ordinary method, the differences are of no great practical significance, since the losses in the ordinary method, properly applied, can be kept down to a low level, even where material of fairly high protein content is used. The real advantage of the other methods lies in the greater reliability of the product.

As between these two methods, there is little to choose on grounds of efficiency of food conservation and quality of product; but on grounds of cost, safety and convenience of application the advantage lies definitely with the molasses process. Neither process need be considered if the crop to be ensiled is at a fairly advanced stage of growth.

Digestibility of Wheat Offals by Poultry. Amongst poultry farmers, the merits for poultry feeding of the various by-products from the milling of wheat form the subject of perennial controversy, which reaches its peak of intensity with reference to the precise value of bran. Practical experience in the use of these products is extremely variable according to the conditions under which they are used, and points almost with certainty to the conclusion that their full nutritive effects—especially in regard to bran—cannot be expressed in the terms of the conventional chemical analysis and of estimates based thereon.

It is none the less true, however, that in so far as the nutritive effects are determined by the amount of energy that the food can place at the disposal of the animal, this part—usually by far the greatest part—of the nutritive effect is measured by the available energy of the digested organic matter.

The study of poultry nutrition problems is hampered by the relative paucity of data as to the digestibility by poultry of the various feeding stuffs commonly used, and all too frequently recourse must be had to the unsatisfactory expedient of using digestion coefficients arrived at in experiments with other classes of animals.

A few years ago Halnan gave us data for the digestibility of several varieties of wheat, and he has now supplemented these data by further measurements of the digestibility by the fowl of samples of broad bran, pollards, and fine middlings.

NOTES ON FEEDING .

From the composition quoted in the report the "fine middlings," with only 8.38 per cent. of protein and 1.92 per cent. of fibre, would appear to have been almost a flour, but the data for the other two products stamp them as typical of bran and straight-run pollards.

In each instance separate data were obtained from four birds (Light Sussex cockerels) and the average digestion coefficients summarized below were arrived at:—

	<i>Bran</i> %	<i>Pollards</i> %	<i>Fine Middlings</i> %
Total Organic Matter	39.4	63.2	84.6
Crude Protein	60.5	80.0	71.5
Ether Extract	53.3	79.5	92.9
Crude Fibre	9.2	5.4	3.4
Nitrogen-free Extract ("Carbohydrates") ..	38.7	63.4	88.0

Having in mind that the pig will commonly digest about 65 per cent. of the organic matter of bran the low figure shown by the poultry is very striking, as also is the very low digestibility of the fibre. It will also be noted that as one passes from the bran to the less fibrous foods the digestibility of all the ingredients other than fibre rises considerably, this effect being marked also as between the pollards and the middlings. That the presence of fibre in poultry feeding stuffs leads to a depression of digestibility of the other ingredients has indeed been noted in previous experiments.

From these experiments it would appear that as a source of energy for poultry the finer grades of wheat offals are considerably superior to bran, the relative energy values (expressed as starch equivalents per 100 lb. of dry matter) being 38 lb., 64.4 lb., and 85.4 lb. for the bran, pollards, and fine middlings respectively. The finer offals are in fact utilized quite as efficiently by poultry as by other farm animals.

That the digestibility of bran may vary appreciably according to its fibre content is illustrated by the following data from a recent Swedish publication.

	<i>Low Fibre</i> %	<i>Normal Fibre</i> %	<i>High Fibre</i> %
Total Fibre Content ..	8.4	9.4	10.4
	<i>Digestible Coefficients (Ruminants)</i>		
Organic Substance	74.9	70.7	65.2
Crude Protein	80.9	77.6	74.3
Ether Extract	83.6	81.0	79.2
Crude Fibre	55.0	47.5	40.0
Nitrogen-free Extract ..	75.5	72.0	66.6

NOTES ON FEEDING

It will be noted that with rising fibre content the digestibility of each ingredient falls, and that the general digestibility, as measured by the organic matter, falls about 5 per cent. for each 1 per cent. increase in the fibre content of the bran.

Digestibility of Molassed Sugar-Beet Pulp by Poultry.

In a second report, Halnan gives the results of tests of the digestibility of this feeding stuff by poultry. Experience in its use with other classes of live stock has been almost uniformly favourable, and in view of its relatively low price, and bulk-producing property when mixed with water, its potentialities for poultry feeding obviously need to be examined at the present time.

Unfortunately Halnan's results do not afford much encouragement, since the average digestibility (by four birds) of the organic matter of the dried pulp amounted to no more than 17.5 per cent. Protein was 33.5 per cent. digestible and nitrogen-free extractives 22.1 per cent. digestible, but the digestibility of the fibre and ether extract were so low that they could not be measured. It is almost certain as Halnan points out, that the conditions under which the trials had to be undertaken would tend to undervalue the digestibility of the pulp, but clearly a very large error would have to be assumed to raise the food out of the category of low digestibility. The results are surprising, in view of the very favourable results obtained by Woodman with pigs, and further tests are desirable before a final judgment is pronounced. Such tests might also be extended to explore the possibility of the development of fishy taint in the egg, such as has occasionally been observed in the milk from cows receiving rather large quantities of molassed beet pulp.

PRICES OF FEEDING STUFFS

Description	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British.. ..	9 0	0 8	8 12	72	2 5	1.29	9.6
Barley, British feeding ..	8 15	0 8	8 7	71	2 4	1.25	6.2
" Argentine ..	8 13	0 8	8 5	71	2 4	1.25	6.2
" Danubian ..	8 5*	0 8	7 17	71	2 3	1.20	6.2
" Persian ..	8 2*	0 8	7 14	71	2 2	1.16	6.2
" Polish ..	8 12§	0 8	8 4	71	2 4	1.25	6.2
Oats, English, white ..	8 13	0 9	8 4	60	2 9	1.47	7.6
" " black & grey ..	8 13	0 9	8 4	60	2 9	1.47	7 6
" Scotch, white ..	9 13	0 9	9 4	60	3 1	1.65	7 6
" Canadian, mixed feed	7 15	0 9	7 6	60	2 5	1.29	7.6
Maize, Argentine ..	5 17	0 7	5 10	78	1 5	0.76	7.6
" DanubianGal.Fox	6 8†	0 7	6 1	78	1 7	0.85	7.6
" South African No. 2 white flat	7 0†	0 7	6 13	78	1 8	0.89	7.6
Beans, English, Winter ..	7 0§	0 17	6 3	66	1 10	0.98	19.7
Peas, English, blue ..	11 5§	0 14	10 11	69	3 1	1.65	18.1
" Japanese ..	26 10†	0 14	25 16	69	7 6	4.02	18.1
Dari	8 10†	0 8	8 2	74	2 2	1.16	7.2
Milling Offals :—							
Bran, British ..	8 2	0 15	7 7	43	3 5	1.83	9.9
" broad ..	8 12	0 15	7 17	43	3 8	1.96	10
Weatings† ..	8 0	0 12	7 8	56	2 8	1.43	10.7
" Superfine†	8 10	0 13	7 17	69	2 3	1.20	12.1
Pollards, imported ..	7 15	0 12	7 3	50	2 10	1.52	11
Meal, barley ..	9 17	0 8	9 9	71	2 8	1.43	6.2
" " grade II ..	9 2	0 8	8 14	71	2 5	1.29	6.2
" maize ..	6 12	0 7	6 5	78	1 7	0.85	7.6
" " germ ..	6 15	0 11	6 4	84	1 6	0.80	10.3
" locust bean ..	7 15	0 5	7 10	71	2 1	1.12	3.6
" bean ..	8 10	0 17	7 13	66	2 4	1.25	19.7
" fish ..	14 15	2 2	12 13	59	4 3	2.28	53
Maize, cooked, flaked ..	7 4	0 7	6 17	84	1 8	0.89	9.2
" gluten feed ..	7 0	0 13	6 7	76	1 8	0.89	19.2
Linseed cake—							
English, 12% oil ..	10 2	1 0	9 2	74	2 6	1.34	24.6
" 9% " ..	9 10	1 0	8 10	74	2 4	1.25	24.6
" 8% " ..	9 5	1 0	8 5	74	2 3	1.20	24.6
Cottonseed cake,							
English, Egyptian seed, 4½% oil ..	5 17	0 18	4 19	42	2 4	1.25	17.3
Cottonseed cake, Egyptian, 4½% oil ..	5 7	0 18	4 9	42	2 1	1.12	17.3
Cottonseed cake, decorticated, 7% oil	9 0†	1 8	7 12	68	2 3	1.20	34.7
Cottonseed meal, decorticated, 7% oil	9 0†	1 8	7 12	70	2 2	1 16	36.8
Coconut cake, 6% oil ..	7 10	0 18	6 12	77	1 9	0.94	16.4
Ground-nut cake, decorticated, 6-7% oil	8 10†	1 8	7 2	73	1 11	1.03	41.3

PRICES OF FEEDING STUFFS (continued)

Description	Price per ton	Manu-rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro-tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Ground-nut cake imported, decorticated, 6-7% oil ..	8 12	1 8	7 4	73	2 0	1·07	41·3
Palm-kernel cake, 4½-5½% oil ..	7 15†	0 12	7 3	73	2 0	1·07	16·9
Palm-kernel cake meal, 4½% oil ..	7 12†	0 12	7 0	73	1 11	1·03	16·9
Palm-kernel meal, 1-2% oil ..	7 5	0 12	6 13	71	1 10	0·98	16·5
Feeding treacle ..	5 0	0 8	4 12	51	1 10	0·98	2·7
Brewers' grains, dried ale ..	6 7	0 11	5 16	48	2 5	1·29	12·5
Brewers' grains, dried porter ..	6 0	0 11	5 9	48	2 3	1·20	12·5
Dried sugar-beet pulp ..	5 2	0 5	4 17	66	1 6	0·80	5·2

* At Bristol.

§ At Hull.

† At Liverpool.

‡ In these instances manurial value, starch equivalent and protein equivalent are provisional.

NOTE : The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex-mill or store. The prices were current at the beginning of February, 1937, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £11 per ton, then since its manurial value is £1 per ton as shown above, the cost of food value per ton is £10. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 8d. Dividing this again by 22·4, the number of pounds of starch equivalent in one unit, the cost per lb. of starch equivalent is 1·43d. Similar calculations will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices :-N., 7s. 2d.; P₂O₅, 2s. 3d.; K₂O, 3s. 6d.

FARM VALUES OF FEEDING STUFFS

The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	<i>Starch equivalent Per cent.</i>	<i>Protein equivalent Per cent.</i>	<i>Per ton £ s.</i>
Barley (imported)	71	6·2	8 8
Maize	78	7·6	5 17
Decorticated ground-nut cake ..	73	41·3	8 11
„ cotton-seed cake ..	68	34·7	9 0
(Add 10s. per ton, in each instance, for carriage.)			

The cost per unit starch equivalent works out at 1·93 shillings, and per unit protein equivalent 1·31 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1936, issue of the Ministry's JOURNAL, p. 816).

FARM VALUES.

Crop	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9·6	7 12
Oats	60	7·6	6 6
Barley	71	6·2	7 5
Potatoes	18	0·8	1 16
Swedes	7	0·7	0 14
Mangolds	7	0·4	0 14
Beans	66	19·7	7 13
Good meadow hay ..	37	4·6	3 17
Good oat straw ..	20	0·9	2 0
Good clover hay ..	38	7·0	4 3
Vetch and oat silage ..	13	1·6	1 7
Barley straw	23	0·7	2 5
Wheat straw	13	0·1	1 5
Bean straw	23	1·7	2 7

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d., post free 7d.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton (2,240 lb.) during week ended Feb. 17.				
	Bristol	Hull	L'pool	London	Cost per Unit¶
Nitrate of Soda (N. 15½%) ..	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	£ s. 7 12d	s. d. 9 10
" " Granulated (N. 16%) ..	7 12d	7 12d	7 12d	7 12d	9 6
Nitrate of Lime (N. 13%) ..	7 0d	7 0d	7 0d	7 0d	10 9
Nitro-Chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of Ammonia:—					
Neutral (N. 20.6%) ..	7 3d	7 3d	7 3d	7 3d	7 0
Calcium Cyanamide (N. 20.6%)	7 2e	7 2e	7 2e	7 2e	6 11
Kainite (Pot. 14%) ..	2 18	2 15	2 15	2 15	3 11
Potash Salts (Pot. 30%) ..	5 0	4 17	4 15	4 17	3 3
" " (Pot. 20%) ..	3 15	3 12	3 12	3 12	3 7
Muriate of Potash (Pot. 50%) ..	8 3	8 1	7 17	8 1	3 3
Sulphate " (Pot. 48%) ..	9 15	9 13	9 9	9 13	4 0
Grd. Rock Phosphate (P.A. 26-27½%) ..	2 12a	2 10a	2 10a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 4	..	3 3f	3 0g	3 9
" " (S.P.A. 13½%) ..	3 1	2 17	2 19f	2 16g	4 1
Bone Meal (N. 3½%, P.A. 20½%)	—	6 10	7 0h	6 15	—
Steamed Bone Flour (N. 4%, P.A. 27½-29½%) ..	5 5i	5 10	5 0h	5 0	—

Abbreviations: N = Nitrogen;
S.P.A. = Soluble Phosphoric Acid;

P.A. = Phosphoric Acid;
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage-paid prices.

§ Prices are for not less than 2-ton lots, nett cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. prices.

a Prices for 4-ton lots f.o.r. Fineness 85% through standard sieve.

d For lots of 4 tons and under 6 tons the price is rs. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra, for lots of 10 cwt. and under 1 ton 15s. extra, and for lots of less than 10 cwt. but not less than 2 cwt. 20s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails; southern rails 1s. 3d. extra.

h Prices shown are f.o.r. Appley Bridge.

i Prices shown are f.o.r. Newport, Mon.

¶ These are calculated by regarding a ton as comprising 100 "units" (equal parts of 22.4 lb.) so that a fertilizer, for example, with 16 per cent. nitrogen, contains 16 such "units" in a ton. Then, if the price per ton of such a fertilizer be divided by the percentage figure, the deduced cost is that of a "unit" of that agent. Those in the table above are based on London prices. (For further explanation, see Advisory Leaflet No. 146, "The Valuation of Artificial Manures," obtainable from the Ministry, free of charge.)

MISCELLANEOUS NOTES

The Agricultural Index Number

THE January index number of prices of agricultural produce at 130 (base 1911-13=100) is, 4 points above that of December, 1936, and 11 points higher than a year ago. (If allowance be made for payments under the Wheat Act, 1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the revised index becomes 133.) During the month under review wheat, barley, oats, fat cattle and sheep, hay and wool realized higher prices than in December, but fat pigs, eggs, butter, cheese and potatoes sold at lower rates.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13 = 100.)

Month	1932	1933	1934	1935	1936	1937
January	122	107	114	117	119	130
February	117	106	112	115	118	—
March	113	102	108	112	116	—
April	117	105	111	119	123	—
May	115	102	112	111	115	—
June	111	100	110	111	116	—
July	106	101	114	114	117	—
August	105	105	119	113	119	—
September	104	107	119	120	127	—
October	100	107	114	113	125	—
November	101	109	114	113	125	—
December	103	110	113	114	126	—

Revised monthly index numbers of prices of Agricultural Produce, allowing for payments under the Wheat Act (a) and the Cattle Industry (Emergency Provisions) Act (b).

Month	1932	1933	1934	1935	1936	1937
January	—	111	119	124	125	133
February	—	110	117	122	123	—
March	—	106	112	118	122	—
April	—	109	116	126	128	—
May	—	105	116	117	120	—
June	—	104	114	117	121	—
July	—	104	117	120	121	—
August	108	108	122	120	124	—
September	108	111	125	128	133	—
October	104	112	121	119	129	—
November	105	113	120	119	129	—
December	107	114	120	120	130	—

(a) Commenced August, 1932. (b) Commenced September, 1934.

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Grain. Wheat at an average of 9s. 9d. per cwt. was 1s. 1d. higher than in December, and the index moves upwards by 15 points to 133. (If the "deficiency payment" under the Wheat Act, 1932, is taken into consideration the figure becomes 134.) Prices of barley and oats also appreciated, the former rising from 9s. 6d. to 10s. per cwt. and the latter from 7s. 1d. to 8s. 2d., the indices at 125 and 120 showing advances of 10 points and 19 points respectively. In January, 1936, wheat averaged 6s. 3d., barley 8s. 1d., and oats 5s. 11d. per cwt., the relative indices being 85, 101, and 87.

Live Stock. Quotations for fat cattle continued to rise, and the average of second quality at 33s. 1d. per live cwt. was 6d. more than in the previous month; this increase, taken in conjunction with the fall in price which took place during the base period, results in the index moving from 91 to 97. The addition of the subsidy under the Cattle Industry (Emergency Provisions) Act, 1934, brings the index up to 112. Fat sheep at an average of 10½d. per lb. for second quality compared with 10¼d. in December; here, again, in consequence of a decline in the base price, the index at 140 shows an increase of 12 points. Baconers at 12s. 4d. and porkers at 13s. 6d. per score (20 lb.) were lower on the month by 1d. and 9d. per score respectively, but, owing to a greater decline in the corresponding price of 1911-13, the index for baconers rises 6 points to 130, while that for porkers remains unchanged at 131.

Both dairy cows and store cattle were cheaper, but only in the case of the latter is the index altered, viz., from 98 to 99. Store sheep realized more money, the index at 118 showing an increase of 5 points, but store pigs declined in price and the index falls from 156 to 152.

Dairy and Poultry Produce. No change occurred in the regional price of liquid milk between December and January, and the index continues at 171. Butter averaged 1s. 2d. per lb. compared with 1s. 2½d. in the previous month, with a consequent fall of 3 points in the index to 95. At 12s. 3d. per 120, eggs were cheaper by 5s. 8d., and the index declines from 106 to 95. Quotations for cheese were slightly reduced, the rise of 4 points in the index to 107, however, being the result of a greater decline recorded during the base years. Prices of all descriptions of poultry were firm and, although the relative indices moved irregularly, the combined index at 120 is 1 point higher than in December.

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Other Commodities. At £7 16s. 6d. per ton potatoes were only 1s. per ton lower than in December, but as a rise took place between December and January of 1911-13 the index falls from 220 to 205. Clover and meadow hay rose in price to a small extent, but insufficiently to change the combined index of 98. At 1s. 4½d. per lb. wool showed an increase of 1d. per lb., and the index at 131 is higher by 13 points.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1935	1936	1936			1937
	Jan.	Jan.	Oct.	Nov.	Dec.	Jan.
Wheat	65	85	113	114	118	133
Barley	101	101	119	115	115	125
Oats	100	87	99	98	101	120
Fat cattle	95	97	95	93	91	97
„ sheep	140	127	131	130	128	140
Bacon pigs	117	107	114	118	124	130
Pork „	128	115	119	126	131	131
Eggs	95	115	141	111	106	95
Poultry	121	127	115	116	119	120
Milk	171	171	171	171	171	171
Butter	83	93	98	97	98	95
Cheese	97	93	101	107	103	107
Potatoes	121	201	202	209	220	205
Hay	101	83	102	102	98	98
Wool	88	96	102	107	118	131
Dairy cows	105	105	107	109	111	111
Store cattle	87	94	95	95	98	99
„ sheep	111	105	132	117	113	118
„ pigs	151	144	150	155	156	152

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	118	124*	133*	131*	134*	134
Fat cattle	110	111	109	108	105	112
General Index	124	125*	129	129	130	133

* Superseding figure previously published.

The Agricultural Produce Index Number for 1936

THE recovery of agricultural prices which occurred in 1934 and 1935 was continued in 1936 when the index figure showed a rise over the preceding year of 5 points and reached 122. When allowance is made for payments under the Wheat Act,

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1932, and the Cattle Industry (Emergency Provisions) Act, 1934, the index for 1936 is further increased by 4 points to 126.

The continued fall in fat cattle prices was arrested, and the index number for 1936 was 5 points above that of 1935. Increased prices were also obtained for wheat, barley, fat sheep, fat pigs, potatoes, butter, cheese, eggs, wool, and vegetables. Milk prices remained constant, while lower prices were recorded for oats, hay, poultry, fruit, and beans.

The percentage increases or decreases in the index numbers for fifteen items as between 1935 and 1936 are set out below :

<i>Increases</i>				<i>Decreases</i>			
<i>Per cent.</i>				<i>Per cent.</i>			
Wheat	..	..	40	Oats	..	..	5
Barley	..	..	4	Hay	..	..	8
Fat Cattle	..	..	5	Fruit	..	..	26
Fat Sheep..	..	..	2				
Pig, Baconers	..	..	10				
Pigs, Porkers	..	..	6				
Potatoes	..	..	38				
Butter	..	..	8				
Cheese	..	..	15				
Eggs	..	..	7				
Wool	..	..	9				
Vegetables	..	..	13				

Grain. The price of home-grown wheat in January was 6s. 3d. per cwt.—or 1s. 6d. more than in January, 1935. This price was again recorded in March, but in all the other months of the year the price was above 6s. 3d. per cwt. In May it was 6s. 9d., in August 7s. 8d. The price fell to 7s. 4d. per cwt. in September, but increased in each of the remaining three months, to 8s. 8d. in December. The average price for the twelve months was 7s. 2d. per cwt., an increase of 2s. per cwt. compared with 1935. The index for the year at 95 was the highest since 1930, when the index stood at 105. If deficiency payments under the Wheat Act of 1932 are taken into account the index for 1936 becomes 123. Barley fell from 8s. 1d. in January to 7s. 4d. per cwt. in April, rose to 8s. 1d. in May, fell during June and July to 6s. 4d. in the latter month and then rose to 10s. 4d. per cwt. in September. From that month there was a steady fall to 9s. 6d. in December, the average for the year being 8s. 3d. per cwt. or 4d. more than the preceding twelve months. The index was 4 points higher at 104 and was thus, with the exception of 1934, the highest recorded since 1929. Oats showed a decline over the year. In January the price was 5s. 11d. per cwt.,

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or 11d. per cwt. less than in January, 1935. The price remained about the same until April and rose during the next four months, reaching 6s. 10d. per cwt. in August. In September the price was 6s. 7d., and from then onwards it rose to 7s. 1d. per cwt. in December. The price for the year was 6s. 4d. per cwt., or 4d. per cwt. less than for the year 1935. The annual index at 89 was 5 points below 1935, 1 and 9 respectively above 1934 and 1933, and 10 points below 1932.

Fat Stock. Quotations for fat cattle showed some improvement during the year compared with 1935. After remaining about the same for the first three months of the year, prices rose to a peak in June. From June to November there was a steady decline from 36s. 5d. to 31s. 3d. per live cwt. Prices recovered to 32s. 7d. in December. The annual average was 33s. 6d. per live cwt., compared with 31s. 10d. in 1935, and the index rose by 5 points to 96. If allowance is made for payments under the Cattle Industry Act, the index becomes 111.

The annual average price of fat sheep at 9½d. per lb. was ¼d. per lb. higher than that for 1935 and the index rose from 127 to 130. This is the highest figure recorded since 1931. Monthly variations were smaller than in 1935, the highest price being 10½d. per lb. and the lowest 9½d. per lb. Both bacon and pork pigs improved in price in 1936. Bacon pigs rose in price from 10s. 2d. in January to 11s. 3d. per score (20 lb.) March, remained fairly stable up to September and then rose to 12s. 5d. per score at the end of the year. Porkers followed a somewhat similar course, the price in January and December being 11s. 10d. and 14s. 3d. per score respectively. The annual average price of baconers was 11s. 4d. per score and the index was 113. Thus, compared with 1935 the price rose by 1s. per score and the index by 10 points. Porkers increased on the yearly average by 8d. per score, and this led to an increase of 6 points in the index to 115.

Dairy and Poultry Produce. The average price of milk for the year was similar to that for 1935, and the index remained the same at 176. Prices of farm butter commenced at 13s. 9d. in January and fell to 11s. 3d. per 12 lb. by June. Thereafter was a fairly steady rise to 14s. 9d. at the end of the year. The year's average was 13s. per 12 lb., 1s. higher than in 1935, and the index rose by 7 points to 96, the highest since 1932. Cheese commenced at 68s. per cwt. in January and rose steadily to 77s. 6d. in August. There was a slight

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setback in the next two months, but at the end of the year the price was 78s. 6d. per cwt. The average price for the year was 75s., being 9s. 6d. higher than in 1935, with the result that the index rose by 13 points to 102. Egg prices fell during the first four months and then rose by 11s. 6d. per long hundred (120) during the period May to November. In December the price fell by 1s. 8d. to 17s. 11d. per long hundred. The yearly average was better by 1s. at 13s. 6d. per long hundred, compared with 1935, and the index rose by 8 points to 117. This is the highest index number for eggs since 1930. The combined index for poultry was 123, and thus showed a fall of 1 point compared with 1935.

Commodity	1931	1932	1933	1934	1935	1936
Wheat	76	78	70	64	68	95
Barley	100	96	100	109	100	104
Oats.. ..	88	99	80	88	94	89
Fat Cattle	122	115	101	99	91	96
Fat Sheep	133	97	110	127	127	130
Pigs, Baconers	107	91	102	112	103	113
Pigs, Porkers	123	98	109	120	109	115
Hay	86	69	70	91†	97	89
Potatoes	188	197	104	119	133	184
Milk	147	144	150	163	176	176
Butter	111	102	94	87	89	96
Cheese	116	127	111	103	89	102
Poultry	144	128	126	120	124	123
Eggs	116	109	105	102	109	117
Fruit	132	180	143	129	196	145
Wool	52	45	66	80	80	87
Beans	74	76	72	75†	77†	76
Vegetables	140	153	141	143	137	155
Hops	77	99	173	102†	101†	102*
General Index ..	120	112	107	114	117	122

Revised index numbers due to payments under the Wheat Act and the Cattle Industry (Emergency Provisions) Act.

Wheat	—	100	128	121	116†	123*
Fat Cattle	—	—	—	104	106	111
General Index ..	—	114	111	119	123	126*

* Provisional.

† Superseding figure previously published.

Other Commodities. During the period January to June, the price of maincrop potatoes remained fairly constant between 154s. and 150s. 6d. per ton. Earlies realized

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154s. 6d. per ton in July and 88s. in August. Maincrop were selling at 110s. 6d. per ton in September and a rise occurred in each of the succeeding months, and by the end of the year the price was 157s. 6d. per ton. The average price for the year was 145s. per ton—an advance of 40s. over the previous year, and the index figure was 184 compared with 133 for 1935. Fruit showed a decline compared with 1935, the index number being 145 in 1936 as against 196 in 1935. The decline was attributable chiefly to the fall in the price of apples and plums. The combined annual average index for vegetables at 155 showed an increase of 18 points over 1935. This was mainly due to the higher prices of carrots, Brussels sprouts, and broccoli and cauliflower.

The index for hay at 89 was 8 points below that for the year 1935. The fall in price was more marked in meadow than in clover hay. The index for beans (for fodder), after rising in the two preceding years, fell in 1936 by 1 point to 76. Quotations for wool at the country market wool sales were higher on the average, and the index for the year rose from 80 to 87.

Trials of Potatoes for Immunity from Wart Disease, 1936

THE trials which are arranged each year by the Ministry with the object of testing new varieties of potatoes for immunity from Wart Disease, were again conducted in 1936 on the farm of the National Institute of Agricultural Botany, Ormskirk, Lancashire. The actual field operations and the taking of records were carried out by Mr. Harold Bryan, B.Sc., and Mrs. McDermott, of the Institute, but the trials were conducted on a plan approved by the Ministry.

Thirty-four stocks were included in the second and subsequent years' tests; one developed Wart Disease. Of the 35 entries for the first year's tests, 4 became infected in the field; 2 proved to be synonyms of existing varieties; 1 was too poor to judge, and 32 were distinct varieties.

As in previous years, the results of the trials have been considered by a small committee composed of representatives of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland, and co-ordinated with the results of the trials carried out by the two last-named Departments at Edinburgh and Kilkeel respectively.

The Committee recommended the approval of 22 new

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varieties, but none of these has actually been added to the approved list, inclusion having been postponed until such time as the raisers intimate that the varieties have actually been or will shortly be introduced into commerce. This intimation has been received in respect of five varieties which had been recommended for approval as the result of trials carried out in previous years and which are now being introduced into commerce: descriptions are given below.

A list of the names of the more commonly grown varieties which have been approved as immune from Wart Disease may be obtained on application to the Ministry.

SECOND EARLY VARIETIES.—**Dunbar Rover**

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Oval; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Tall, upright; stems thick and strong, green, pink towards maturity, wing broad; leaf open; leaflets long and broad, ashy green, leaflet stalks long; secondary leaflets large and often borne on leaflet stalks.
<i>Flowers.</i>	White, large and profuse; flower stalks long and strong; buds fairly dark.

Gleniffer

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Kidney; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, spreading; stems strong and branching; wing waved; leaf fairly rigid, close; leaflets small, pointed, with margins slightly waved, medium green and glossy but yellowing towards maturity, terminal leaflet markedly drooping; secondary leaflets fairly numerous and small.
<i>Flowers.</i>	Purple tipped white, profuse; buds dark; berries freely.

Ulster Monarch

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Kidney; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, spreading, vigorous; stem branching, markedly hairy, wings broad and plain; leaflets large, medium green, waxy appearance, margins fluted, secondary leaflets inconspicuous.
<i>Flowers.</i>	White, not profuse; stalks short; buds green, usually drop off without opening.

EARLY MAINCROP VARIETY.—**Early Pride.**

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Kidney; skin white; flesh yellow; eyes shallow.
<i>Haulm and Foliage.</i>	Medium height, open, upright, weak; colour yellowish-green; leaf very short, top growth erect; leaflets small, cupped, terminal leaflet round; secondary leaflets small and numerous; wings crinkled; stems thin and numerous, deeply bronzed.
<i>Flowers.</i>	Light blue-purple, numerous.

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LATE MAINCROP VARIETIES.—Dunbar Archer

<i>Sprout.</i>	Blue.
<i>Tuber.</i>	Short oval ; skin white ; flesh white ; eyes shallow to medium.
<i>Haulm and Foliage.</i>	Tall, upright ; stems very strong, branching freely, mottled, wing very wavy ; leaf rigid, leaf and leaflet stalks tinged pink ; leaflets medium green and pointed ; secondary leaflets numerous.
<i>Flowers.</i>	White, fairly profuse, anthers orange ; buds pink.

Dunbar Standard

<i>Sprout.</i>	Pink.
<i>Tuber.</i>	Long oval ; skin white ; flesh white ; eyes shallow
<i>Haulm and Foliage.</i>	Tall, upright and rigid ; stems very strong and branching, slightly tinged purple, wing broad and straight ; leaf rigid, leaflets large, medium to dark green, dull.
<i>Flowers.</i>	White ; anthers loose, flower stalks short ; buds medium green.

Agricultural Scholarships

THE Ministry invites applications for the under-mentioned scholarships which are being offered for award this year under the scheme of scholarships for the sons and daughters of agricultural workmen and others :—

Ten Senior Scholarships, tenable at Agricultural Colleges or University Departments of Agriculture, for diploma or degree courses in an agricultural subject, or at Veterinary Colleges for courses in veterinary science ;

Ten Extended Junior Scholarships (for those who have already held Junior Awards), and *120 Junior Scholarships*, tenable at Farm Institutes or similar institutions, for courses not exceeding a year in duration, in agriculture, horticulture, dairying, or poultry husbandry.

The scholarships are open to the sons and daughters of agricultural workmen or of working bailiffs, smallholders and other rural workers whose means and method of livelihood are comparable with those of agricultural workmen, and to persons who are themselves *bona fide* workers in agriculture. The value of the awards is such that neither the recipients nor their parents are normally required to make any contribution towards the cost of the training provided. The usual method of selection is by interview, no written examination being required, but candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of

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instruction and must also intend to follow an agricultural pursuit on completion of their training.

The scheme under which these scholarships are awarded has now been in operation for 15 years, and assistance has been granted to over 1,600 persons. Many past students have succeeded in improving their positions substantially, and several hold important posts (scientific and otherwise) in the agricultural industry; for example, a smallholder's son now holds an appointment as Pathologist to a Colonial Research Institute; two former agricultural labourers have obtained posts as Marketing Assistant in the Agricultural Economics Department of a University and manager of a large farm respectively; a former dairymaid is now an Instructress at an Agricultural College. Of those who have been trained no fewer than 10 per cent. hold administrative, teaching, or research appointments of an agricultural nature, while a further 20 per cent. occupy posts of a supervisory character, such as managers of farms, nurseries, dairies, and so on. It will be seen, therefore, that the scholarships afford exceptional opportunities to those who are able to obtain them and take full advantage of the education provided.

Full information concerning the scheme, including forms of application and a leaflet outlining the types of career open to students who have completed courses of training, may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, or locally from the offices of County Councils. The latest date for submitting applications is April 30, 1937.

Agricultural Wages Act, 1936 : Irish Free State

THE Agricultural Wages Act, 1936, which was passed by the Irish Free State Government in November last, provides for regulating the wages of agricultural workers and for setting up the organization necessary for this work. The executive functions under the Act are vested in a central Board (the Agricultural Wages Board), consisting of a Chairman, three neutral members, four employers' members, and four workers' members, all of whom are appointed by the Minister of Agriculture. With the exception of the Chairman, who holds office during the Minister's pleasure, members normally serve for three years. The presence of the Chairman at a meeting of the Board constitutes a quorum. Provision is

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made that when two or more ordinary members (i.e., other than the Chairman) are present at a meeting of the Board, including at least one workers' representative and one employers' representative, and all are in favour of making an Order, it shall be deemed to be made. If no more than one ordinary member is present the Chairman shall make the order, and in any other case the Chairman shall either make the order or adjourn its making to a future meeting. For administrative purposes the country is to be divided into a number of "wages districts" and these are to be grouped into "wages areas." An Agricultural Wages Committee will be appointed for each "wages area," and the Chairman of the Board will also be the Chairman of all such Committees. Each district within an area will be represented on the Committee for that area by not less than two members. Provision is made for equal representation of employers and workers on the Committees. All ordinary members of Committees are to be appointed by the Minister and to serve for one year.

The primary function of the Board is to fix minimum rates of wages for agricultural workers in respect of each wages district. Such rates may be fixed to apply universally to a district, or to any part of a district, or to special classes of workers, and subject to variation according to the period, hours or conditions of employment, or so as to provide for differential rates in respect of overtime employment. An order may define the benefits or advantages which may be reckoned in lieu of wages in cash, and the value at which they are to be reckoned. Before fixing or varying the minimum rates of wages, the Board is required to serve notice on the Wages Committee, for the area concerned, and the Committee may then, within two months, make recommendations, which the Board must take into consideration in making the order. Every order in regard to minimum wages must be laid before Dail Eireann as soon as made and that body may by resolution annul it within twenty-one days.

Where the Board is satisfied that a worker is incapable, by reason of physical injury or mental deficiency, or any infirmity due to age or to any other cause, of earning the minimum rate of wage, it must grant a Permit exempting him, on such conditions as may be prescribed in the Permit, from the minimum rate requirements. Other provisions relate to offences and legal proceedings under the Act, and the appointment and the powers of officers of the Board.

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Foot-and-Mouth Disease.—No further outbreaks of Foot-and-Mouth Disease occurred in the Derbyshire Infected Area after January 9, and, consequently, the Area was finally released from restrictions on January 30.

The Herefordshire Infected Area was contracted to approximately 5 miles round Donnington, Ledbury, on January 31, but owing to a further outbreak at Donnington on February 5 it has been necessary to maintain the restrictions over this 5 miles area for a further period. Provided that the disease position continues to be satisfactory, this area will be released from restrictions on February 27.

Farm Workers' Minimum Rates of Wages.—A meeting of the Agricultural Wages Board was held at Kings Buildings, Smith Square, London, S.W.1, on Tuesday, February 16, 1937, Mr. W. B. Yates, C.B.E., J.P., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders :—

Cambridgeshire and Isle of Ely.—An Order fixing minimum and overtime rates of wages to come into force on March 1, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until February 28, 1938. The minimum rates are (1) for male workers of 21 years of age and over employed wholly or mainly as horsemen, cowmen and shepherds (other than workers employed solely as stockmen or yardmen), 39s. 6d. (instead of 38s. 6d. as at present) per week of the hours necessary for the performance of their customary duties; (2) for other male workers of 21 years of age and over, 32s. 6d. (instead of 31s. 6d. as at present) per week of 48 hours in winter, except in the weeks in which Christmas Day and December 27, 1937, fall when the hours are 39½, and 50 hours in summer, except in the weeks in which Good Friday, Coronation Day, Whit Monday and August Bank Holiday fall, when the hours are 42. Provision is made for an adjustment of the hours to meet cases where a holiday is given on July 26, 1937, instead of on August Bank Holiday. The overtime rates are 9½d. per hour on weekdays (instead of 9d. per hour as at present), 11d. per hour on Sundays, Christmas Day, December 27, 1937, Good Friday, Whit Monday and August Bank Holiday (as at present) and 11d. per hour on Coronation Day; and (3) for female workers of 18 years of age and over 6d. per hour with overtime at 7d. per hour as at present.

Middlesex.—An Order fixing minimum and overtime rates of wages to come into force on February 28, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 5, 1938. The minimum rates are (1) in the case of workers employed wholly or mainly on the duties of stockmen, for male workers of 21 years of age and over 43s. 9d. (instead of 42s. 6d. as at present) and for female workers of 18 years of age and over 31s. 3d. (instead of 30s. as at present) per week of 60 hours, except (a) in the week in which Christmas Day and Boxing Day fall together when the hours are 40, (b) in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks, when the hours are 50, (c) in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall when the hours are 50; (2) in the case of workers employed wholly or mainly as carters, for male workers of 21 years of age and over 40s. 10d. (instead of 39s. 8d. as at present) and for female workers of 18 years of age and over 29s. 2d. (instead of 28s. as at present) per week of 56 hours, except (a) in the week in which

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Christmas Day and Boxing Day fall together when the hours are 38, (b) in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks, when the hours are 47, (c) in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall when the hours are 47; (3) in the case of casual workers, for male workers of 21 years of age and over 8½d. per hour (instead of 8¼d. per hour as at present) and for female workers of 18 years and over 6½d. per hour (instead of 6d. per hour as at present), and (4) in the case of workers other than those specified above, for male workers of 21 years of age and over 36s. 5½d. (instead of 35s. 5d. as at present) in summer and 35s. (instead of 34s. as at present) in winter, and for female workers 26s. 0½d. (instead of 25s. as at present) in summer and 25s. (instead of 24s. as at present) in winter per week of 50 hours in summer, except in the weeks in which Easter Monday, Coronation Day, Whit Monday, August Bank Holiday and any other bank holiday which may be proclaimed by Royal Proclamation fall, when the hours are 42, and 48 hours in winter, except in the week in which Christmas Day and Boxing Day fall together when the hours are 30, and in the weeks in which Christmas Day and Boxing Day fall when those days fall in separate weeks when the hours are 39. The overtime rate for all male workers of 21 years of age and over is unchanged at 10½d. per hour, and for female workers of 18 years of age and over unchanged at 7½d. per hour.

Monmouthshire.—An Order fixing minimum and overtime rates of wages to come into force on March 16, 1937 (i.e., the day following that on which the existing rates are due to expire) and to continue in operation until September 15, 1937. The minimum rates for male workers of 21 years of age and over are 32s. 6d. (as at present) per week of 54 hours with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday and August Bank Holiday (as formerly) and 11½d. per hour on Coronation Day.

Worcestershire.—An Order fixing minimum and overtime rates of wages to come into force on March 1, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 6, 1938. The minimum rates for male workers of 21 years of age and over are 31s. (as at present) per week of 52 hours in summer, except in the weeks in which Good Friday and Coronation Day fall when the hours are 43, and 48 hours in winter, except in the week in which Christmas Day falls when the hours are 39½, with overtime as at present and on Coronation Day at 9d. per hour. For female workers of 18 years of age and over, the minimum rate remains unchanged at 5d. per hour with overtime on Sundays and in excess of 8 hours on any other day at 5½d. per hour (as at present), and 5½d. per hour on Coronation Day.

Glamorganshire.—An Order fixing minimum and overtime rates of wages for workers (other than male workers employed wholly or mainly in forestry) to come into force on March 2, 1937 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1938. The minimum rates for male workers of 21 years of age and over employed wholly or mainly as stockmen, cattlemen, cowmen, horsemen, shepherds or bailiffs are 38s. (instead of 37s. as at present) per week of 60 hours with overtime unchanged at 10d. per hour, and for other male workers of 21 years of age and over 34s. 6d. (instead of 33s. 6d. as at present) per week of 52 hours in summer and 48 hours in winter, with overtime unchanged at 9d. per hour on week-

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days and 10d. per hour on Sundays. For female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour with overtime rates also unchanged at 7d. per hour on weekdays and 7½d. per hour on Sundays.

Enforcement of Minimum Rates of Wages.—During the month ending February 12, 1936, legal proceedings were taken against ten employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

Committee Area	Court	Fines Imposed	Costs Allowed	Arrears of Wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Derbyshire	Derby ..	3 0 0	—	25 0 0	3
" ..	Chesterfield	4 0 0	1 0 0	81 14 9	4
Durham ..	Darlington	4 0 0	3 3 3	18 19 9	4
Lancashire	Garstang	9 0 0	4 2 0	71 0 0	3
Lincs. (Kes- teven and Lindsey)	Wragby ..	0 8 0	0 2 0	3 14 0	1
Shropshire	Market Drayton	*	0 13 0	16 0 0	1
" ..	Shrewsbury	1 10 0	0 10 0	8 15 0	1
Somerset ..	Bridgwater	5 0 0	0 7 6	18 15 5	1
Carmarthen	Llandovery	3 0 0	1 0 0	55 0 0	2
Glamorgan	Maesteg ..	*	0 13 0	6 0 0	1
		29 18 0	11 10 9	304 18 11	21

* Dismissed under the Probation of Offenders Act.

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS: ENGLAND

Hertfordshire : Mr. J. Fowles, N.D.H., has been appointed Assistant Instructor in Horticulture, *vice* Mr. C. P. Quarrell, B.Sc.

Lancashire : Mr. H. Temperton, B.Sc.(Agric.), N.D.A., N.D.D., has been appointed Assistant Instructor in Poultry-keeping, *vice* Mr. G. M. Robertson, who will take up the post of Head Poultry Instructor on April 9 next when Mr. C. H. Dobbin retires.

Leicestershire : Mr. D. H. Findlay, B.Sc.(Agric.), N.D.A., N.D.D., has been appointed Agricultural Organizer, *vice* Mr. T. Hacking, LL.B., M.Sc., and will take up his duties on April 1 next.

WIRELESS TALKS TO FARMERS, MARCH, 1937

<i>Station and Date</i>	<i>Time : p.m.</i>	<i>Speaker</i>	<i>Subject</i>
National : March 1	6.20	Messrs. J. G. Stewart and F. Rayns	Sugar Beet.
„ 8	6.20	Messrs. J. G. Stewart and J. C. Wallace	Potatoes.
„ 15	6.20	Various	Debate from Bristol Studio.
„ 22	6.20	Mr. J. G. Stewart	Grass Mixtures. Lucerne and Sainfoin.
Midland : March 3	6.45	Our Country Correspondent : Mr. Walter Pitchford	Northamptonshire
„ 10	6.40	Mr. Henry G. Robinson	For Midland Farmers.
„ 15	7.30	Mr. Henry J. Massingham	Our Country Correspondent.
West : March 4	6.50	—	Fortnightly Letter to Western Farmers.
„ 8	6.0	From Seale-Hayne Agricultural College	Farming Feature.
„ 11	6.40	Messrs. A. W. Ling and W. D. Hay	For Western Farmers : What's Going on in Somerset ?
„ 18	6.50	—	Fortnightly Letter to Western Farmers.
„ 25	6.40	Messrs. A. W. Ling and W. T. Price	For Western Farmers.
Week commencing March 28	—	• —	Fortnightly Letter for Western Farmers.
North : March 12	6.25	Prof. J. A. Hanley and a Farmer	How I Started Farming.
„ 25	6.40	Mr. A. McVicar	Sugar Beet in Lincolnshire and Tweedside.
Welsh : March 2	8.0	Messrs. Moses Griffiths & R. J. Gardner (in Welsh)	For Welsh Farmers : Discussion on Different Types of Cows, Sheep and Pigs.
„ 19	7.30	Messrs. Moses Griffiths & Meurig Jones	For Welsh Farmers : The Union of Agriculturists in Wales.
Scottish : March 4	6.40	Mr. G. C. Middleton	For Scottish Farmers : The Live Stock Marketing Bill.
„ 10	6.50	Mr. Joseph F. Duncan	For Scottish Farmers.
„ 18	6.20	Mr. W. M. Findlay	For Scottish Farmers. Potato Growing.
Northern Ireland : March 5	7.30	Mr. R. F. Thompson	Care and Handling of Eggs for market.
„ 12	7.30	Mr. Peter Fitzpatrick	Farmers' Work and Worry.
Week commencing March 28	—	„ „	„ „ „

NOTICES OF BOOKS

Fifty Years of Field Experiments at Woburn. By Sir E. John Russell, D.Sc., F.R.S., and Dr. J. A. Voelcker, C.I.E., M.A. Pp. xvii + 392; 48 figs. & 146 Tables. (London: Longmans, Green & Co. 1936. Price 21s.)

Four writers have had a hand in the compilation of this volume, which is the seventh in the series of Rothamsted monographs on Agricultural Science: Dr. J. A. Voelcker—the Voelckers, father and son, have been associated with Woburn since its inception as a research station in 1876—supplies the historical account and the description of the experiments; Mr. W. G. Cochran, of Rothamsted, examines the results statistically; Sir E. John Russell discusses their bearing on agricultural science and practice; and Dr. E. M. Crowther, also of the Rothamsted staff, adds as Part IV a chapter on the soils of the Woburn plots.

The mere mention of Woburn sends us back to the early days of agricultural research in this country when Rothamsted (1843) and Woburn (1876) comprised our all. Strangely, fate has cast Woburn for the minor rôle, for, as it would appear from this analysis of fifty years' work, the questions to which Woburn has furnished final answers are disappointingly few. They are clearest, perhaps, where they were less urgently needed, as on the continuous cropping plots, but have been either not forthcoming at all in such distinctively Woburn investigations as the experiments on Stackyard Field on the residual manurial values of cake and corn fed to animals, and the green manuring experiments, or only partially and unsatisfactorily because of the original plan of the field experimentation and subsequent alterations in the plots.

Yet the volume had to be written and it has its place. The results are collected, analysed by the new methods of statistics, and interpreted and applied. Woburn is added in compact form to the libraries of research and teaching stations for the specialists and students, but we do not count upon including, and spare him by excluding, the lay reader of agricultural literature.

Like the others of this series, the production of the book is first class.

Country Conditions. By Valentine Ackland. Pp. 126. (London: Lawrence & Wishart. 1936. Price 2s.)

With a good deal of restraint on her political bias, Miss Ackland might have produced a much more interesting and even more convincing account of conditions in rural Britain. Her obviously strong prejudices have severely weakened her book. The case for collective farming is not really assisted by sweepingly detrimental generalizations about farmers and landlords. The author has been unfortunate indeed if all the farmers of her acquaintance "have such a hatred of their own men that they will gladly be ruined themselves if that will bring about the ruin of the workers": such an attitude would, to say the least, be obviously short-sighted. Her review of rural life may be useful in some sense as a corrective to the "charmingly lyrical descriptions" of those "imaginative idealists" with whom she finds herself at issue, but it is not "a fair description of the English village to-day" to say that "housing conditions, if they have altered at all, must have altered for the worse" since 1840. Nor is it true that "conditions are hardly any better than they were in 1830"; although all who know the countryside intimately, whether they share Miss Ackland's views or not, will agree that much more remains to be done to ameliorate the lot of those who live and work on the land. This book must be read with a close watch on the author's international views.

NOTICES OF BOOKS

Practical Animal Husbandry. By William C. Miller, M.R.C.V.S., F.R.S.E., and E. D. S. Robertson, M.R.C.V.S. Second edition. Pp. xi + 427, and 180 figs. (Edinburgh: Oliver and Boyd. 1937. Price 15s.)

A scientific textbook can only continue to serve its purpose if subject to reasonably frequent revision. This manual of *Practical Animal Husbandry*, first published in 1934, now appears in a new edition containing over 100 pages of additional matter. The article on "Herd Management" has been revised by Mr. J. Mackintosh, who also contributes a section dealing with the Milk Marketing Board. Mr. H. R. Davidson has made important additions to the article on "Pig Management," and has supplied an article on the Pigs Marketing Board. The section on "Poultry-keeping" has been brought up to date by Miss E. Fergus, and Mr. N. Walker has contributed to the sections dealing with legislation affecting live stock. The articles on Rabbits and Fur-bearing Animals are by Dr. J. N. Pickard. The book is well illustrated and the information given should be of great assistance to veterinarians and stockowners.

An Introduction to the Scientific Study of the Soil. By Norman M. Comber. Pp. v + 206, and 25 figs. (London: Edwin Arnold and Co. 1936. Price 7s. 6d.)

Professor Comber's *Introduction to the Scientific Study of the Soil* needs no introduction to British readers. Since its first publication in 1927, it has established itself as a standard textbook for those who require in small compass a clear and concise account of the nature and principles of the modern study of soils. It is essentially a book for those who are making their first acquaintance with the subject, particularly students who are taking soil science as part of a general agricultural course, or as subsidiary to some special branch of agricultural science. It also serves to bring the state of modern soil studies to the knowledge of workers in other branches of science, as well as agricultural scientists whose student days lie far behind them.

In preparing the present edition, Professor Comber has been faced with the difficulty of selecting suitable material from the imposing volume of new work that has been done since the appearance of the second edition. A perusal of the book shows that this selection has been wisely exercised. The new material is concerned mainly with humus and with the mineral colloidal complex. The important chapter on soil water has been brought up to date by the inclusion of a lucid exposition of capillary potential and pF , and the section on field experimentation has also been modified.

Professor Comber has succeeded in presenting in some 200 pages an account of the essential features of the state of soil science at the close of 1936. This has only been possible by the use of that clarity and economy of expression of which he is such a master. He has performed a great service to the subject by presenting it in a form which makes possible its diffusion among a wide public.

Soil Erosion and its Control. By Quincy Claude Ayres. Pp. xi + 365, 234 figs. (London: McGraw-Hill Publishing Company, Ltd. 1936. Price 21s.)

During recent years the government and people of the United States have become acutely conscious of the dangers of soil erosion and of the necessity for its control. This is shown by the institution of the Soil Conservation Service in 1935. Publications dealing with this important subject are therefore of living interest.

The volume under notice is occupied principally with the description, often in considerable detail, of methods actually in use for the control

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of erosion and for the reclamation of land that has been damaged by erosion. The work is profusely illustrated with photographs and diagrams. The descriptions of methods are fully and clearly given, and one gains the general impression that the problem is being successfully tackled. The use of special implements, with or without power traction, is a notable feature.

Although the problem of soil erosion is of small magnitude in Great Britain, it is extremely grave in many parts of the Empire, notably in Africa. *Soil Erosion and its Control* will undoubtedly be of interest and value to those who have to cope with soil erosion overseas. The problem and its control are lucidly presented and the book may therefore be strongly recommended.

The Journal of the South-Eastern Agricultural College. Edited by the Rev. S. Graham Brade-Birks, M.Sc. (Manch.), D.Sc. (Lond.), F.Z.S. No. 39. Pp. 72. (Wye: South-Eastern Agricultural College. January, 1937. Price 2s. 6d., post free; residents in Kent and Surrey, 1s. 6d., post free.)

The current issue of this Journal contains reports of activities in connexion with advisory chemistry, agricultural economics, bacteriology, botany, entomology, hops, mycology, pig husbandry and veterinary science. The review of investigations on machinery used in spraying is continued. The general reader cannot fail to be impressed with the amount of research that is being carried on at Wye.

Our Natural Resources and their Conservation. Edited by A. E. Parkins and J. R. Whitaker. Pp. x + 650. (New York: John Wiley & Sons; London: Chapman and Hall. 1936. Price 25s.)

This book is a contribution to the mass of semi-popular, semi-technical propaganda now being issued as an indispensable part of the great national effort to save America from the imminent destruction with which that country is threatened as a consequence of over-exploitation. Conservation has acquired a particular significance, almost synonymous with land salvation, in America. The idea of conservation is not new, but apart from spasmodic attempts by enlightened individuals, it was Theodore Roosevelt who first roused the people to its nation-wide importance. During his presidency attention was given mainly to plans for conserving mineral, forest and water resources. The high prices of the war and post-war period, however, encouraged waste on an unprecedented scale, and it needed the depression, and a series of droughts and spectacular dust storms to rouse the nation again to the much increased gravity of the situation. During Franklin Roosevelt's presidency conservation has become a political and social question of the first importance. The focal point has now shifted to the soil, the loss of which by erosion and exhaustion is infinitely more serious and irreparable than the wastage of underground wealth with which the former conservation movement was mainly concerned.

The earlier organizations, however, still exist, have sprung into greater activity than ever, and are reinforced by new organizations, particularly the Soil Conservation Service. Thus "conservation" in America now involves the preservation or rational utilization, with the needs of posterity in mind, of agricultural and pastoral land, of forests, of minerals and oil, of industrial products, of wild animals, of recreational resources (national parks), and finally of man himself regarded as the greatest national asset. The book deals with all these aspects of conservation, each chapter being written by an expert (22 in all) in his particular subject. It gives a most impressive picture of the magnitude of the national effort which ineluctable

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circumstances are compelling the American people to make in the interests of self-preservation. The effort is now only beginning, but the people are gradually becoming conscious that on its successful outcome more than on anything else depends the whole future of the United States.

Similar conservation movements, directed particularly against soil erosion, are developing in all the newer countries of the world, and in the U.S.S.R. and South Africa, as in the United States of America, have already become integral parts of national policy. Together they represent one of the most portentous movements of our time. They are moulding peoples into nations with a definite objective, and they are laying the foundations on which new civilizations may be built. In Great Britain we have husbanded our resources in the past and drawn largely on the fertility of other countries for our sustenance, so that soil exhaustion and erosion have been negligible, but in the Empire overseas they are matters of immediate and vital concern, and are bound ultimately to affect the relations between the component parts of the Commonwealth. Each country will have to adopt its own measures for dealing with the menace, but the pioneer work in America merits the closest study, not only for its scientific value but also as an outstanding example of national co-operation.

Regional Types of British Agriculture. Edited by J. P. Maxton, M.A., B.Sc., B.Litt. Pp. 318, & Maps. (London: George Allen and Unwin, Ltd. 1936. Price 12s. 6d.)

It is stated in the editor's preface that the original conception of this volume of essays was to provide an outline of farming in Great Britain for the benefit of overseas visitors to the International Conference of Agricultural Economists held at St. Andrews in September, 1936. There is no doubt, however, that this book will provide a much wider public with the most useful information on the various systems of farming to be found in this country. In the past, information of this kind has only been available in the form of Press articles or in bulletins and reports of various universities and agricultural colleges.

The book is, in reality, a collection of essays written, with one exception, by agricultural economists who are, or have recently been, stationed at the various advisory centres attached to universities or agricultural colleges in England, Wales and Scotland. These officers, through the very nature of their work, have a detailed knowledge of the agriculture and rural life of their respective provinces and are, therefore, in an authoritative position to give the reader a clear and concise outline of the subject on which they have been asked to write.

The editor realizes that one of the difficulties in bringing together such a collection of essays as these is to obtain uniformity in the presentation of the material. The editor, however, must have arranged with the contributors that the information should be presented in as similar a way as possible, with the result that one reads about the north of England and then moves on to the Midlands without feeling any appreciable difference in the presentation of the facts.

Within the compass of a brief essay it is quite impossible for the contributor to cover all aspects of farming, but the reader will find in any of these essays a very clear picture of the main systems practised and the conditions that gave rise to them. It is of more than passing interest to note that, since the introduction of recent legislation, the pace at which technical changes have taken place has been greatly accelerated.

The editor is to be congratulated on bringing together, in such a readable form, material collected and analyzed by men who are competent to interpret the changes that have taken place in farming and their effect in building up the systems we find practised in Great Britain to-day.

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous.

- The Place of Agriculture in Home Defence. *Viscount Lymington*. (J. Fmrs' Cl., Lond. Pt. 5 (Nov. 1936), pp. 77-93).
- World Agriculture and the Problems of Nutrition, with discussion. *F. L. McDougall*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov. 1936), pp. 203-222).
- The Relations of Land Tenure and Agriculture, with discussion. *H. M. Conacher*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov., 1936), pp. 167-201).
- The Lullingstone Silk Farm, with discussion. *Lady Hart Dyke*. (J. Roy. Soc. Arts, 85, 4388 (25 Dec. 1936), pp. 153-165).
- Empire Wines. *H. E. Laffer*. (J. Roy. Soc. Arts, 85, 4385 (4 Dec. 1936), pp. 77-96).
- Village Waste. *R. C. Wood*. (Emp. J. Exp. Agric. 4, 16 (Oct. 1936), pp. 357-363). With a note by *R. D. Anstead* (p. 364).
- Thatching and the Thatcher. *J. A. Miles*. (Estate Mag. 36, 11 (Nov. 1936), pp. 842-844).
- Wages in the Winchester Manors. *W. Beveridge*. (Econ. Hist. Rev. 7, 1 (Nov. 1936), pp. 22-43).

Agricultural Economics.

- Farm Economics. I. Agricultural Policy. II. Farm Management. III. Marketing, Prices and Supplies. IV. General. *C. S. Orwin*. (Fmrs' Guide Agric. Res. (in 1935), pp. 87-107).
- Research and Price Control, with discussion. *R. L. Cohen*. (J. Proc. Agric. Econ. Soc. 4, 3. (Nov. 1936), pp. 223-249).
- Organising Farm Workers. *J. F. Duncan*. (J. Proc. Agric. Econ. Soc. 4, 3 (Nov. 1936), pp. 250-358).
- Combine Harvesting Costs in 1935. *R. P. Askew*. (Fm. Econ. 2, 4 (Oct. 1936), pp. 53-57).
- Agrarkrisen und Stockungsspannen zur Frage der langen " Welle " in der wirtschaftlichen Entwicklung. *S. von Ciriacy-Wantrup*. (Ber. ü Landw. (122 Sonderheft) (1936) (445 pp.).) (Agrarian Crises and Periods of Stagnation.)
- Labour Requirements on a Mechanised Wheat Farm. *H. Whitby*. (Scot. J. Agric. 19, 4 (Oct. 1936), pp. 349-358).

Agricultural Machinery.

- Farm Implements and Machinery. I. Power Farming. II. Tractors. III. Cultivating Implements. IV. Harvesting. V. Grass Conservation. VI. Electricity. VII. Miscellaneous. *S. J. Wright*. (Fmrs' Guide Agric. Res. (in 1935), pp. 60-86.)
- The Possession of Cattle and Agricultural Machinery by Tenants under Hire-Purchase Agreements. The Legal Position of the Landlord. *J. R. Smith-Saville*. (J. Land Agents' Soc. 35, 11 (Nov. 1936), pp. 624-639).

Soils and Fertilizers.

- Soils and Fertilizers. *Sir E. J. Russell*. (Fmrs' Guide Agric. Res. (in 1935), pp. 177-229.)
- Soil Science in the Twentieth Century. *J. Hendrick*. (Scot. J. Agric. 19, 4 (Oct. 1936), pp. 309-320).

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- The Action of Fertilisers on Turf. *T. W. Evans* and *I. G. Lewis*. (*Agrostologist* (Autumn, 1936), pp. 3-9).
 Die Umsetzungen der Düngerkalks im Erdboden. *H. Kuron*. (*Landw. Jb.* 83, 5 (1936), pp. 601-710.) (The Changes of Lime Manure in the Soil.)
 The Fertilizer Value of Some Concentrated Materials, particularly Urea and Guanidine and their Nitrates and Phosphates. *A. H. Lewis*. (*J. Agric. Sci.* 26, 4 (Oct. 1936), pp. 509-526).

Plant Pests, Diseases, etc.

- Soil Conditions and the Take-all Disease of Wheat. *S. D. Garrett*. (*Ann. App. Biol.* 23, 4 (Nov. 1936), pp. 667-699).
 The Effect of Various Chemical Treatments on the Activity of the Viruses of Tomato spotted wilt and Tobacco Mosaic. *R. J. Best* and *G. Samuel*. (*Ann. app. Biol.* 23, 4 (Nov. 1936), pp. 759-780 + 1 plate.)
 Investigations on the Control of Leather Jackets. *R. B. Dawson* and *R. B. Ferro*. (*J. Bd. Greenkeep. Res.* 4, 15 (Autumn, 1936), pp. 239-261).
 Flooding as a Means of Reducing Wireworm Infestations. *M. C. Lane* and *E. W. Jones*. (*J. Econ. Ent.* 29, 5 (Oct. 1936), pp. 842-850.)
 Studies on *Oscinella frit*. Linn. Inheritance of Resistance of Oats to attack by the Fly and the Combination of Resistance with Other Characters of Agricultural Importance. *N. Cunniffe*. (*Ann. app. Biol.* 23, 4 (Nov. 1936), pp. 822-844).
 Experiments on the Resistance of the Flour Moth (*Ephestia Kuhnella* Zell.) to abnormally High Temperatures. *G. H. Mansbridge*. (*Ann. App. Biol.* 23, 4 (Nov. 1936), pp. 803-821.)
 La Vaccination Antiaphteuse. *M. Mossou* and *R. Lignières*. (*C. R. Acad. Agric. Fr.* 22, 30 (9 Dec. 1936), pp. 1042-1053).
 A Study of Heart-rot of Young Sugar-beet Plants Grown in Culture Solutions. *E. A. Rowe*. (*Ann. Bot.*, Lond. 50, 200 (Oct. 1936), pp. 735-746. With eleven figures in the text.)
 The Control of Common Scab (*Actinomyces Scabies* (Thaxt.) Guos). *H. Cairas*, *T. N. Greeves* and *A. E. Musket*. (*Ann. App. Biol.* 23, 4 (Nov. 1936), pp. 718-742).
 Observations on the Black-stem Disease of Lucerne in Britain. *F. W. Toovey*, *J. M. Waterston* and *F. T. Brooks*. (*Ann. App. Biol.* 23, 4 (Nov. 1936), pp. 705-717 + 1 plate).
 A Leaf-spot Disease of Sweet William caused by the *Heterosporium Echinulatum*. *C. C. Burt*. (*Trans. Brit. Mycol.* 20, 3 & 4 (Nov. 1936), pp. 207-215).

Crops.

- Crop Husbandry in the 18th Century. *G. E. Fussell*. (*J. Land Agents' Soc.* 35, 12 (Dec. 1936), pp. 671-677).
 Wheat Problems and Policies in Germany. (*Wheat Stud. Stanford Univ.* 13, 3 (Nov. 1936), pp. 65-140).
 The Italian "Battle of Wheat." *C. T. Schmidt*. (*J. Fm. Econ.* 18, 4 (Nov. 1936), pp. 645-656).
 The A.I.V. Process in Theory and Practice. *A. I. Virtanen*. (*Int. Rev. Agric. Mon. Bull. Agric. Sci. Prac.* 27, 10 (Oct. 1936), pp. 371-393).
 Crops and Plant Breeding. I. Grassland. II. Weed Control. III. Plant Development and its artificial Control. IV. Wheat Investigation. V. Variety Trials. *G. D. H. Bell*. (*Fmrs' Guide Agric. Res.* (in 1935), pp. 1-35.)

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- The Influence of Temperature and Available Nitrogen Supply on the Growth of Pasture in the Spring. *G. E. Blackman*. (J. Agric. Sci. 26, 4 (Oct. 1936), pp. 620-647).
- The Composition of Grass laid up for Winter Keep. *B. Thomas* and *B. M. Boyns*. (Emp. J. xp. Agric. 4, 16 (Oct. 1936), pp. 368-378.)
- Unser heutiges Wissen "über den Anbau von Raps und Rübsen." *G. Baur*. (Der Forschungsdienst 2, 8 (15th October, 1936) pp. 390-397.) (Our Present Knowledge of Rape and Colza Cultivation.)
- Experiments on the Growing of Chicory (for Drying). *F. Hanley* and *F. Tunnington*. (Emp. J. Exp. Agric. 4, 16 (Oct. 1936), pp. 379-384.)
- Einfluss der Düngung auf die Qualität der Zuckerrübe. *E. Rantenberg*. (Der Forschungsdienst 2, 8 (1st Oct. 1936), pp. 353-365.) (Effects of Manuring on the Quality of Sugar-Beet.)

Horticulture.

- Lilacs. *H. G. Hillier*. (J. Roy. Hort. Soc. 61, 11 (Nov. 1936), pp. 449-464 + 8 plates).
- Spores and Spore Germination in Wild and Cultivated Mushrooms (*Psalliota spp.*). *D. M. Cayley*. (Trans. Brit. Mycol. 20, 3 & 4. (Nov. 1936), pp. 225-239 + Appendix by *E. M. Wakefield*, pp. 239-241 + 1 plate.)

Livestock and Feeding.

- The Feeding of Livestock. I. Nutrition and Public Health. II. Nutrition and Disease in Farm Animals. III. Mineral Requirements. IV. Protein Supply. V. Utilization of Carbohydrates. VI. Mechanical Factors in Nutrition. VII. Utilization of Grassland Produce. VIII. Lucerne. IX. Cattle Feeding. X. Sheep Feeding. XI. Pig Feeding. XII. Individual Feeding Stuffs. *C. Crowther*. (Fmrs' Guide Agric. Res. (in 1935), pp. 177-229.)
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